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MINERALOGICAL ABSTRACTS

Vol. 14—No. 6 June 1960

AGE DETERMINATION AND ISOTOPE MINERALOGY

ALES (A. A.), MAPPER (D.), MORGAN (J. W.), WEBSTER (R. K.), & WOOD (A. J.). *Some geochemical determinations using radioactive and stable isotopes*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 242–248.

The determination of Cu, Cr, Ge, As, and Sb in meteorites by the method of neutron activation is described. Results for 15 iron and two stony-iron meteorites are given and comparisons made with those of other workers. The determination of Cs in stony-iron meteorites by mass spectrometric isotope dilution is also described, together with the results for seven specimens. The application of the same method to Rb–Sr age determinations on feldspars is explained and discussed with the results of nine analyses, which include those of five specimens from Scotland. The results for four of the latter indicate the following ages: orthoclase, Hill of Fare, Aberdeenshire, 390 m.y.; orthoclase, Millay, off the Sound of Harris, 1655 m.y.; albite moonstone, Harris, 250 m.y.; orthoclase, Badcall quay, Loch Axford, Sutherlandshire, 1900 m.y. [M.A. 13–503].

A. G. D.

ELLIERS (J. W. L. DE), BURGER (A. J.), & NICOLAYSEN (L. O.). *The interpretation of age measurements on the Witwatersrand uraninite*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 237–238.

From a study of the isotopic composition of Witwatersrand galenas it is concluded that the minimum age of the parent mineral which provided their radiogenic component is 2470 m.y. There is a brief review of other relevant age determinations.

A. G. D.

OSHOULT (J. N.). *Radioactive disequilibrium studies as an aid in understanding the natural migration of uranium and its decay products*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 230–236, 5 figs.

The radioactive decay products of ^{238}U , ^{235}U , and ^{232}Th are considered and those most useful in elucidating the history of a specimen are singled out. Chemical and radio-metric procedures for measuring the amounts present are

outlined. The paper is limited to the interpretation of disequilibrium in sedimentary rocks, of which four types are recognized: (1) where all daughter products are deficient, (2) where ^{230}Th is anomalously low, (3) where the radioactivity is due almost entirely to ^{226}Ra and its immediate daughter products, and (4) where U is deficient relative to its daughter products. Geochemical explanations are discussed. The use of the geologically short-lived isotopes ^{231}Pa , ^{230}Th , and ^{226}Ra to date recently deposited U is referred to, and the results compared with those of ^{14}C age determinations on material from the same sites.

A. G. D.

VRIES (A. E. DE) & HARING (A.). *An improvement on age determination by the C^{14} method*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 249–250.

The range of the ^{14}C method has been extended about 20,000 years by enriching the ^{14}C content twelvefold in a thermal diffusion column. The sample is converted into CO prior to enrichment and gas enriched in ^{14}C and ^{18}O is withdrawn from the bottom of the column. The ^{14}C enrichment factor is obtained from measurement of the initial and final ^{18}O contents. A formula relates the enrichment factor and measured radioactivity to the age of the specimen.

A. G. D.

CLAYTON (R. N.). *Oxygen isotope fractionation in the system calcium carbonate–water*. Journ. Chem. Physics, 1959, **30**, 1246–1250, 2 figs.

The $^{18}\text{O}/^{16}\text{O}$ exchange reaction between water and calcite has been studied over the temperature range 190° to 750°C . Equilibrium constants for the reaction fit the equation $\ln K = 2725T^{-2}$ for all temperatures above 0°C . The implications to geological thermometry are discussed.

R. A. H.

CHAKRABARTY (S. C.), ROY (R. K. DUTTA), & CHOWDHURY (A. N.). *Tscheffkinitite [chevkinite] from Orissa*. Journ. Sci. Industr. Res., 1958, **17A**, 326–327.

The analysis of a titano-silicate of rare earths is given and the age of the mineral calculated at 1270 m.y. Identification of mineral doubtful.

A. P. S.

AMSTUTZ (G. C.). *New sulfur isotope ratios from South American volcanoes*. Tschermak's Min. Petr. Mitt., 1959, ser. 3, **7**, 130-133, 1 fig.

Four new sulfur isotope ratios of native volcanic sulfur are reported and plotted in a histogram together with other values obtained from the literature. A. P.

DEGENS (EGON T.). *Das O^{18}/O^{16} Verhältnis im Urozean und der geochemische Stoffumsatz*. Neues Jahrb. Geol. Paläont., Monatshefte, 1959, 180-186, 1 fig.

The lower $^{18}O/^{16}O$ ratio in the hydrosphere relative to that

of the primordial ocean is due to the formation of sediments during earth history. A change of 0.1 per cent is equivalent to the formation of about 50 kg cm⁻² of clays and carbonates. Sandstones and conglomerates, which are predominantly chemically unaltered weathering residues, have influence on the $^{18}O/^{16}O$ ratio in the oceans. A. P.

Age determinations are cited in abstracts of papers, and by ROBINSON (S. C.), p. 399; KLEMIC (HARRY), et al., 400; SPRINGER (G. D.), DAVIES (J. F.), p. 402; STALLERMAN (I. E.), et al., p. 410.

APPARATUS AND TECHNIQUES

X-ray, petrographical, d.t.a.

PARRISH (W.) & LOWITZSCH (K.). *Geometry, alignment and angular calibration of X-ray diffractometers*. Amer. Min., 1959, **44**, 765-787, 9 figs.

Rapid, precise, and reproducible methods for the alignment and angular calibration of the goniometer of X-ray diffractometers are given. Drawings of simple mechanical aids to adjustments to fit Philips equipment are included. The alignment, determination of the zero angle to $\pm 0.01^\circ 2\theta$, precise setting of the 2:1 angular relation between the receiving slit and the specimen surface, and the adjustment of the anti-scatter slits can be completed in about one hour. Many of the factors affecting the precision and accuracy of measurements are discussed. B. H. B.

DONNAY (J. D. H.) & DONNAY (GABRIELLE). *Sine table for indexing powder patterns*. Amer. Min., 1959, **44**, 177-179.

References are given to mathematical tables which assist in the determination of $Q = 1/d^2 = \sin^2\theta/(\lambda/2)^2$ for measured values of 2θ . A. C. H.

VENKATAKRISHNAN (P. V.). *Design of a structure factor computer for X-ray crystal structure analysis*. Journ. Sci. Industr. Res. [India], 1958, **17B**, 339-345.

A coordinate positioning system using telephone uniselectors is used to simulate the double Fourier series occurring in the structure factor calculation of X-ray crystal structure analysis. The orthogonal components of the structure factors are obtained both in magnitude and sign serially as D.C. voltages. A. P. S.

BARRAUD (J.) & BARBEZAT (S.). *Transposition en couleurs de phénomènes appartenant à des domaines spectraux invisibles. Diagrammes de Laue polychromes*. Bull. Soc. franç. Min. Crist., 1957, **80**, 1-17. Avec la collaboration technique de H. Pignol et R. Richard.

Laue spots in colour are obtained by subtractive 3-colour combination from three diagrams taken at three different X-ray tube voltages. The colour of the spots varies from red to violet when the corresponding X-wavelength decreases from one end of the spectrum employed to the other. E. J.

BOWLEY (R. E.). *Direct colour prints from polished and etched sections*. Canad. Min., 1958, **6**, 294-297. R. B. F.

MACCONAILL (M. A.). *The compound polarizer*. Nature, 1957, **180**, 603.

Polarized light of variable colours can be produced in the field of a microscope ocular by using a polarizer consisting of discs of 'polaroid', 'polythene', and 'Rayophane', in the order from the light source; each of the discs can be rotated about a common axis. C. H. K.

[CHERKOSOV (YU. A.)] Черкосов (Ю. А.). О применении «фокального экранирования» при измерениях показателей преломления иммерсионным методом. [Application of 'focal screening' to measurement of indices of refraction by the immersion method.] In: Современные методы минералогического исследования горных пород и минералов [Modern methods of mineralogical investigations of rocks, ores and minerals.] Госгеолтехизд. Москва [Gosgeoltechn., Moscow], 1957, pp. 184-207.

An appropriate mask in the focal plane of the objective produces critical dispersion colour effects when the refr. index of the immersion liquid coincides with that of the transparent solid. Three arrangements of masks may be contrived: (1) 'apertural', sensitivity ± 0.02 , (2) 'unilateral', sensitivity ± 0.002 , and (3) 'central' for which the sensitivity is said to be 'better than the Becke method'. Advantages over the Becke method are that the grains remain visible at the match point and that inclusions cause less trouble in extinguishing the match point. Counting of grains of different

stances of similar refr. ind. is facilitated by immersion in a liquid of appropriate intermediate refr. ind., producing distinctive dispersion colours.

R. E. W.

TCH (FRANK J.). *Macro point counting*. Amer. Min., 1959, **44**, 667-669, 1 fig.

The method is based on use of graticule which has 676 equally spaced points, and a co-ordinate reference system. The technique of using this system is explained. A. C. H.

EYROWITZ (ROBERT), CUTTITA (FRANK), & HICKLING (NELSON). *A new diluent for bromoform in heavy liquid separation of minerals*. Amer. Min., 1959, **44**, 884-885, 1 table.

Dimethyl sulfoxide, $(\text{CH}_3)_2\text{SO}$, a colourless, odourless liquid is recommended as a diluent for bromoform in place of volatile and combustible acetone; dimethyl sulfoxide has b.p. 18.4°C , b.p. 189°C , sp. gr. 1.100 at 20°C . B. H. B.

ROST (I. C.). *An elutriating tube for the specific gravity separation of minerals*. Amer. Min., 1959, **44**, 886-890, 1 fig.

A vertical elutriating glass tube is described which is capable of separating 10 g. sized samples in a rising current of water. Closely sized fractions between 40 and 200 mesh are used. Galena separations of better than 95% purity are obtained from specimens containing galena, gahnite, magnetite, and quartz.

B. H. B.

RAŠNAROVÁ (J.). *Nový typ laboratorního flotátoru* [A new type of laboratory flotation apparatus]. Silikáty, 1957, **1**, 279-282, 2 figs.

An apparatus for laboratory flotation of minerals is described. Flotation cells can be easily exchanged. Weight of the apparatus is about 17 kg. Diagram and photograph of the apparatus are given.

J. K.

HAUB (B. M.). *Using the microscope for specific gravity determination of minute mineral grains*. Amer. Min., 1959, **44**, 890-891.

A sample is prepared as for a refractive index determination, and a set of liquids of varying density is used. The test specimen is clamped to the stage and the microscope is tilted to 60° or more; the floating or sinking of the smallest grains is noted as the stage is rotated.

B. H. B.

CAMPOS (JOÃO ERNESTO DE SOUZA). *Sobre um processo de medidas angulares em grandes cristais*. Bol. Soc. Brasileira Geol., 1956, **5**, 71-74.

Interfacial angles of large crystals embedded in a matrix

are obtained, without destroying the specimens, by taking the impression of the faces with a melted dental plaster which after cooling in cold water is put on the reflecting goniometer. Values obtained in the 'negative' are the same as are obtained from natural crystals, with an average error of 2 to 5 minutes.

A. B. R.

PAPAILHAU (J.). *Nouveau dispositif d'analyse thermique différentielle*. Bull. Soc. franç. Min. Crist., 1958, **81**, 142-147, 9 figs.

A description is given of a d.t.a. apparatus which can operate up to 1250°C in a strictly controlled atmosphere or in a partial vacuum. Samples are limited to 0.3g, and a new type of sample holder is used. Examples are given of d.t.a. curves obtained in different atmospheres for calcite, chalybite, and chalcopyrite.

R. A. H.

GAŠPARÍN (C.), PROKS (I.), & ŠIŠKE (V.). [Methods of accelerated differential thermal analysis. Silikáty, 1959, **3**, 73, 1 table, 10 figs.] Brit. Ceram. Abstr., 1959, abstr. 2004.

With increasing rate of heating and constant weight of sample, the temperature difference between the standard and the sample, and the temperature interval of peaks increase during the reaction. Therefore smaller weights of sample may be used in the accelerated d.t.a. (0.03g or even less). With heterogeneous reversible reactions the amount is so small that it cannot affect further decomposition or other reactions which occur at higher temperatures. The temperature interval of peaks also increases with the fineness of the sample. Under suitable conditions the accelerated d.t.a. have practically the same shape as those of normal d.t.a.

A. G. C.

SCHNITZER (M.), WRIGHT (J. R.), & HOFFMAN (I.). *Use of the thermobalance in the analysis of soils and clays*. Anal. Chem., 1959, **31**, 440-444, 8 figs.

The chief applications of thermogravimetry to soil and clay analyses are the determination of hygroscopic moisture, organic matter, inorganic carbonates, and (for clay minerals) the lattice water. Pyrolysis curves for illite, bentonite, kaolinite, biotite, tremolite, vermiculite, allophane, gypsum, and various hydrated Fe and Al oxides are illustrated.

R. A. H.

Spectrophotometric, volumetric, etc.

WARREN (R. J.), HAZEL (J. F.), & McNABB (W. M.). *An ultraviolet spectrophotometric method for the determination of small amounts of vanadium in ores and steel*. Anal. Chim. Acta, 1959, **21**, 224-226.

The method uses the absorption of the orthovanadate ion

at 270 m μ in 1N sodium hydroxide. It has been used for the determination of 0.05 to 0.60% V in ores. The interference of Cr is eliminated by the use of an ion-exchange resin.

R. A. H.

MICHAL (J.), PAVLÍKOVÁ (E.), & ZÝKA (J.). *Die Bestimmung von Silber in Erzen*. Zeits. anal. Chem., 1958, **160**, 277-279.

Ag in ores may be determined spectrophotometrically at 420 m μ with Mercupral (Cu²⁺-disulfiram complex), following an HF-HClO₄-HNO₃ decomposition.

R. A. H.

GUEDES DE CARVALHO (R. A.). *Determination of titanium in presence of niobium by differential spectrophotometry*. Anal. Chem., 1958, **30**, 1124-1127.

In the determination of Ti in ilmenite by the Ti-H₂O₂ complex a correction factor, which is separately determined in H₂SO₄, is applied to allow for the Nb content [M.A. **13**-258].

R. A. H.

ZALESKAYA (S. V.). [*Colorimetric determination of vanadium in bauxite and 'red mud'*. Trudy Gor'kovsk. Politekh. Inst., 1957, **13**, 90-93.] Anal. Abstr., 1959, **6**, abstr. 127.

NaOH is the best flux for getting the sample into solution; removal of SiO₂ is unnecessary. V is determined by the colorimetric estimation of the yellow tungstovanadophosphate formed by the addition of Na₂WO₄.

R. A. H.

PLUMMER (M. E. V.), LEWIS (C. L.), & BEAMISH (F. E.). *Fire assay for platinum in ores and concentrates*. Anal. Chem., 1959, **31**, 254-258.

The ore concentrate is fused with sodium carbonate and an Fe-Ni-Cu alloy is formed. The button is dissolved, the noble metals are separated by cation exchange and chromatography, and Pt and Pd are determined colorimetrically.

R. A. H.

PLUMMER (M. E. V.) & BEAMISH (F. E.). *Determination of platinum and palladium in ores and concentrates. New fire assay method*. Anal. Chem., 1959, **31**, 1141-1143.

A new approach to the analytical extraction of Pt and Pa from ores involves a reduction of these elements by the walls of a carbon crucible from a fused mixture. The metal alloy is removed and dissolved in acid, passed over a cation exchange column, and Pt and Pa are determined in the effluent by conventional colorimetric methods. [M.A. **14**-86, 238]

R. A. H.

COLLINS (P. F.), DIEHL (H.), & SMITH (G. F.). 2, 4, 6-Tripyridyl-s-triazine as a reagent for iron. *Determination of iron in limestone, silicates, and refractories*. Anal. Chem., 1959, **31**, 1862-1867, 4 figs.

A highly specific colorimetric reagent for iron is applied to the determination of Fe in silicates and limestone following a sodium carbonate-sodium borate fusion in silvite crucibles. For the granite G-1 and diabase W-1 the average values of total iron determined as Fe₂O₃ were 1.85 and 10.91% respectively.

R. A. H.

MURATA (K. J.). *Spectrochemical analysis for trace elements in geological materials*. Symposium on spectrochemical analysis for trace elements, A.S.T.M., 1958, no. 23, 67-79.

R. A. H.

VESELÝ (M.) & ŠULCEK (Z.). [*Rapid methods of analysis of metals and inorganic materials. VI. Colorimetric determination of copper in natural carbonate*. Chem. Listy, 1958, **52**, 2010-2012.] Anal. Abstr., 1959, abstr. 2484.

Tetraethylthiuram disulphide acts as a selective reagent for Cu allowing the determination of Cu in the presence of Fe. The procedure is carried out in a mixture of HClO₄ and H₃PO₄ after decomposing the sample with HNO₃. This method is suitable for trace amounts of Cu (<5 p.p.m.) and has an accuracy of $\pm 1.3\%$ (relative).

R. A. H.

VOINOVITCH (I. A.) & DEBRAS (J.). [*Analysis of iron in silicates by sulphosalicylic acid*. Industr. Céram., 1958, no. 500, 257-261, 1 fig., 4 tables.] Brit. Ceram. Abstr., 1959, abstr. 1560.

Determination of Fe in silicates by sulphosalicylic acid has the following advantages: the Fe can be determined whether it is in the Fe²⁺ or Fe³⁺ form; the method is accurate, sensitive, and rapid; it is applicable in the visible region of the spectrum; interference by normal concentrations of Si, Ca, Mg, Na, K, Al, and Ti is negligible; the coloured complex formed is stable; the method is applicable over a wide range, 0.02-25 p.p.m.; the cost of reagents is reasonable. Disadvantages are: interference by certain concentrations of Mn and Cr; a tendency for high contents of TiO₂ to give high results, and the slightly inhibiting effect of a content of Al₂O₃. The method is simpler, more rapid, and more sensitive for low contents of iron than the classic volumetric methods.

A. G. C.

GONZÁLEZ CARRERÓ (J.) & CARBALLIDO RAMALLO (O.). [*Micro-methods for the determination of silica*. An. Real Soc. Esp. Fis. Quím., B, 1958, **54**, 191-208.] Anal. Abstr., 1959, **6**, abstr. 3921.

Existing methods for the micro-determination of SiO₂ are reviewed. For methods involving the formation of molybdosilicic acid the test solution must not contain HCl < 0.05N nor > 0.2N. If quartz is present, at least 5 minutes fusion with NaOH, or 1 hour at 1000°C with Na₂CO₃ is necessary.

R. A. H.

INOVITCH (I. A.), DEBRAS (J.), YELATCHICH (C.), & ZALESSKY (Z.). [Determination of aluminium with Complexone III. Industr. Céram., 1958, no. 501, 291-295.] Anal. Abstr., 1959, **6**, abstr. 3903.

Al, Ti, and Fe are complexed at pH 4.5 and 100°C with excess of EDTA: the excess is then back-titrated with Cl_2 using ethanolic dithizone as indicator, and allowance made for the Fe and Ti content. The method is recommended for routine analysis of clays and similar aluminosilicates.

R. A. H.

IRMA (M. R.), BHUCHAR (V. M.), & THERATTIL (K. J.). Direct chelatometric method for the estimation of calcium or magnesium in the presence of phosphate. Nature, 1957, **179**, 1244.

The method takes only a few minutes. Errors in various terminations vary from nil to 0.6%.

C. H. K.

USTAFIN (I. S.) & KASHKOVSKAYA (E. A.). [Analytical use of phenolcarboxylic acids of the triphenylmethane series. Rapid determination of calcium and magnesium in rocks. Nauk. Dok. Vyssh. Shkol'y. Khim. i Khim. Tekhnol., 1958, 297-299.] Anal. Abstr., 1959, **6**, abstr. 1641.

After removal of the oxides of trivalent metals, (Ca+Mg) titrated with EDTA using the dyestuff Chromoxan green G as indicator; Ca is determined by titration in the presence of murexide.

R. A. H.

ELCHER (R.), CLOSE (R. A.), & WEST (T. S.). The complexometric titration of calcium in the presence of magnesium. A critical study. Talanta, 1958, **1**, 238-244.

R. A. H.

INUS (A. M.). [Photometric determination of chromic oxide by means of EDTA (disodium salt) in chrome magnesites and in chromium ores. Zavod Lab., 1957, **23**, 662-663.] Anal. Abstr., 1958, **5**, abstr. 85.

Chromium can be determined in the presence of iron by using the ores with KHSO_4 , treating with sodium potassium tartrate and EDTA, adjusting the pH to 4, and examining the solution absorptiometrically.

R. A. H.

SATENKO (YU. I.) & KLIMKOVICH (E. A.). [Use of EDTA (disodium salt) for the photometric determination of chromium in chromite. Trud'y Komiss. Anal. Khim., Akad. Nauk SSSR, 1958, **8**, 169-177.] Anal. Abstr., 1959, **6**, abstr. 2120.

The method is based on the photometry of an aqueous solution of the complex of Cr with EDTA (disodium salt) in an acetate buffer medium (pH \approx 4).

R. A. H.

KONDRACHINA (E. G.), EGOROVA (L. G.), & SONGINA (O. A.). [Use of the amperometric method for the analysis of chromites and chromomagnesitic refractory materials. Izv. Akad. Nauk KazSSR, Ser. Khim., 1957, 45-50.] Anal. Abstr., 1958, **5**, abstr. 3709.

Full details are given for the determination of Cr, total Fe, and FeO in chromite.

R. A. H.

DINNIN (JOSEPH I.). Rapid analysis of chromite and chrome ore. Bull. U.S. Geol. Survey, 1959, **1084-B**, 31-68.

A specimen is fused with Na_2O_2 in a zirconium crucible. Major and minor constituents are determined separately from aliquots of a single solution derived from the fusion product. Cr_2O_3 is determined volumetrically by ferrous ammonium sulfate-dichromate titration; SiO_2 is determined spectrophotometrically using the reduced silicomolybdate colour; total Fe is determined by a modified differential spectrophotometric method using orthophenanthroline. MgO and CaO are determined by titration with Versene; Al_2O_3 and TiO_2 are determined spectrophotometrically with alizarin red-S and Tiron, respectively. MnO , V_2O_5 and NiO are determined spectrophotometrically using the permanganate, phosphotungstovanadate and α -furyldioxime colours, respectively. The precision is comparable to that of the more conventional methods.

K. S.

SARUDI (I.). Notizen zur Analyse des Chromeisensteins. Zeits. anal. Chem., 1958, **163**, 34-37.

A method is described for the separation of Cr from Al in the aqueous solution obtained after fusing chromite with NaOH and KNO_3 . The Cr is oxidized with nitric acid and solid KClO_3 and then separated from Al by precipitation as lead chromate. A triplicate analysis of chromite is given.

R. A. H.

X-ray fluorescence, flame photometric

BROWN (F.). X-ray fluorescence analysis. Analyst, 1959, **84**, 344-355, 7 figs.

A review. This is now a well-established method of analysis and may be applied to the determination of elements from Na(11) to U(92) in powder or liquid samples. Coefficients of variation of about 1% in the concentration range 5-100%, and of 5% in the 0.1 to 1% range can usually be obtained.

R. A. H.

LONG (J. V. P.) & MCCONNELL (J. D. C.). A mineralogical application of X-ray absorption microspectroscopy: the hydration of larinite. Min. Mag., 1959, **32**, 117-127, 5 figs.

The technique of X-ray absorption microspectroscopy is described with particular reference to the determination

of calcium in a calcium silicate hydrogel formed in minute amounts from larnite in sealed hydration cavities in larnite-bearing rocks, where the cavities also contain calcium hydroxide (portlandite) and afwillite. The method is applicable also to other elements and enables chemical data to be obtained from selected small (10μ diameter) areas in a normal petrological thin section. R. A. H.

CLAISSE (FERNAND). *Accurate X-ray fluorescence analysis without internal standard*. Prelim. Rept. no. 327, 1956, Dept. Mines, Province of Quebec, Canada, 1-16, 15 figs. [Also available in French.]

The technique is fusion in borax of ores of minerals, followed by casting the fused mix into small glass discs. The glass discs are then exposed to X-rays and, by study of the fluorescence, quantitative measurements can be made for elements with atomic number greater than 22 (Ti). The merits of this technique are: (1) effects of variation in grain size, in powder samples, are nullified by solution in borax; (2) heterogeneous samples show similar absorption characteristics because of the dilution in borax; (3) states of combination of elements are destroyed by solution. Borax dissolves most minerals, therefore the technique could be used with most ores. For sulfide minerals and graphite, oxidation previous to solution in borax must be carried out. An accuracy of $\pm 0.02\%$ absolute is claimed at the low percentage level. G. P.

SUN (SHIOU-CHUAN). *Fluorescent X-ray spectrometric estimation of aluminium, silicon, and iron in the flotation products of clays and bauxites*. Anal. Chem., 1959, **31**, 1322-1324, 1 fig.

Al, Si, and Fe are quantitatively determined by fluorescent X-ray spectrometry with an average error of about 5% and a lower limit of detection for each element of around 0.2%.

R. A. H.

HOWER (J.). *Matrix corrections in the X-ray spectrographic trace element analysis of rocks and minerals*. Amer. Min., 1959, **44**, 19-32, 6 figs.

Matrix effects which must be accounted for are: (1) attenuation of incoming beam, (2) mutual excitation of elements, (3) absorption of outgoing fluorescent radiation. Effects (1) and (3) are appreciable for most trace elements of common rocks and minerals. Curves were plotted of the mass absorption coefficient *vs* wave length for elements which are commonly major constituents in rocks and minerals. Plots show that relative absorptions of elements are virtually constant at all wave lengths. Curves are given of the absorption of various rocks relative to Al_2O_3 standard. A complete matrix correction can be made for nickel and

heavier elements by determining the absorption of the rock relative to Al_2O_3 at one wave length. Suggested analytical methods are given. A. C. H.

HOUK (W. W.) & SILVERMAN (L.). *Determination of iron, chromium, and nickel by fluorescent X-ray analysis. Aqueous solution method*. Anal. Chem., 1959, **31**, 1006-1012. R. A. H.

EMERSON (DONALD O.). *Correlation between X-ray emission and flame photometer determination of the K_2O content of potash feldspars*. Amer. Min., 1959, **44**, 661-666, 1 fig.

The accuracy of the X-ray emission spectroscopy method was tested against the flame photometry method for the determination of K_2O in feldspars by analyzing 89 samples. Comparison of the results shows that the X-ray emission technique is as accurate a method of feldspar K_2O determination as the conventional flame photometric.

A. C. H.

HOWLING (H. L.) & LANDOLT (P. E.). *Determination of lithium in silicate minerals and leach solutions by flame photometry*. Anal. Chem., 1959, **31**, 1818-1819.

The minerals are brought into solution by H_2SO_4 and HF treatment followed by a CaCO_3 precipitation. The precipitant used and the final pH of the solution were found to be critical. There is, however, no loss of Li when using CaCO_3 if taken to the methyl red end point. The samples of spodumene on replicate analysis gave 3.18 ± 0.01 and $3.50 \pm 0.02\%$ Li_2O : the precision of the method was $\pm 0.45\%$. [M.A. 14-6]

R. A. H.

MATHERS (J. E.), POTTER (G. V.), & SHEARER (N. W.). *Determination of calcium in wolframite ore*. Anal. Chem., 1958, **30**, 1412-1413.

Ca is separated from other elements in a stream of anhydrous HCl and determined with a flame photometer. For low amounts (0.01 to 0.2%) this method is more reproducible than the oxalate precipitation method.

R. A. H.

YOFÉ (J.) & FINKELSTEIN (R.). *Elimination of anion interference in flame photometric determination of calcium in the presence of phosphate and sulphate*. Anal. Chim. Acta, 1958, **19**, 166-173, 10 figs.

R. A. H.

FOSTER (W. H., Jr.) & HUME (D. N.). *Factors affecting emission intensities in flame photometry*. Anal. Chem., 1959, **31**, 2028-2032, 10 figs.

— — — *Mutual cation interference effects in flame photometry*. Ibid., 2033-2036, 3 figs.

Cation interference effects are a true enhancement of the emission intensity. On the basis of results obtained with the alkali and alkaline earth metals several recommendations are made regarding optimum conditions for flame electrochemical analysis.

R. A. H.

ALLOWAY (N. McN.). *Flame-photometric determination of iron, copper and cobalt in cobalt mattes and concentrates.* Analyst, 1959, **84**, 505-508.

A method is described for the rapid determination of 50% Fe, 0.1 to 25% Cu, and 1 to 15% Co. R. A. H.

ORD (C. L.). *Successive determination of manganese, sodium and potassium in cement by flame photometry.* Bull. A.S.T.M., 1958, **233**, 57-63.

R. A. H.

ZUBAY (M.). [*Flame-photometric determination of small amounts of barium.* Magyar Kem. Foly., 1958, **64**, 483-484.] Anal. Abstr., 1959, **6**, abstr. 3418.

The determination of Ba in solution as BaCl_2 at 770 m μ , in the presence of large amounts of Ca, is described.

R. A. H.

ENIS (O.), RAINS (T. C.), & DEAN (J. A.). *Extraction and flame spectrophotometric determination of lanthanum.* Anal. Chem., 1959, **31**, 187-191, 4 figs.

A procedure is given for the determination of La in monazite sand.

R. A. H.

GINOVITCH (I. A.) & DEBRAS (J.). [*Determination of sodium, potassium and lithium in silicates by flame photometry.* Industr. Céram., 1958, no. 502, 321-327.] Anal. Abstr., 1959, **6**, abstr. 3879.

R. A. H.

ABRIKOVA (E. A.). [*Increase of sensitivity and accuracy of the flame-photometric determination of caesium in minerals.* Zhur. Anal. Khim., 1959, **14**, 41-44.] Anal. Abstr., 1959, **6**, abstr. 4282.

The presence of K in excess of the Cs increases the intensity of the Cs line at 8521 Å by a factor of up to 25. The standard curve of intensity against Cs concentration (0.2 to 100 μg per ml) is almost rectilinear in the presence of 2500 μg of K per ml. Details are given of the method used: the mean relative error is $\pm 4.45\%$ for 0.01% Cs and $\pm 9.7\%$ for 0.001% Cs.

R. A. H.

SANDOPULO (G. I.) & SHCHERBOV (D. P.). [*Determination of strontium in silicates and carbonates in a flame photometer with a liquid colour-filter.* Zavod. Lab., 1958, **24**, 1432-1434.] Anal. Abstr., 1959, **6**, abstr. 3896.

The strontium band at 640 to 690 m μ is used, with a 1 cm thickness of a 1% aqueous solution of Rhodamine B as a colour filter. Corrections are made for the presence of Ba and Ca.

R. A. H.

Chemical, various

CHIRNSIDE (R. C.). *Introductory lecture. Silicate analysis: a review.* Journ. Soc. Glass Technol., 1959, **43**, 5-29T, 6 figs., 1 pl.

In an introduction to a Symposium on rapid methods of analysis the various classical and rapid schemes of analysis for silicates are critically reviewed. It is considered that in some of the rapid chemical schemes a large amount of chemical manipulation is involved and that the premise that analysts of lesser skills can operate these techniques is not borne out by experience. The use of the flame photometer for the determination of alkalis has brought about a major improvement in the classical schemes.

CLULEY (H. J.). *Introduction to uses of EDTA.* Ibid., pp. 30-36T.

SALES (ROSEMARY). *The rapid analysis of glasses and raw materials using EDTA.* Ibid., pp. 37-53T, 3 figs.

BENNETT (H.). *A gravimetric method for the determination of silica.* Ibid., pp. 59-61T.

Silico-molybdic acid is formed which is then precipitated as quinoline silico-molybdate. The precision of the method is about $\pm 0.25\%$: borate and fluoride do not interfere.

CLULEY (H. J.). *The determination of potassium oxide in glass.* Ibid., pp. 62-72T.

POWELL (R. J.) & TODD (J.). *The application of the flame photometer and the spectrograph to the analysis of a soda-lime glass.* Ibid., pp. 73-85T, 1 fig.

FLETCHER (W. W.). *The determination of the sodium, potassium and lithium oxide contents of soda-lime-magnesia-silica, soda-boric oxide-silica, and potassium oxide-lead oxide-silica glasses using an EEL filter flame photometer.* Ibid., pp. 86-93T.

HEDGECOCK (G. A.). *Experience with a Beckman flame photometer.* Ibid., pp. 94-99T, 2 figs.

R. A. H., A. G. C.

JEFFERY (P. G.) & WILSON (A. D.). *The precipitation of manganese in silicate-rock analysis.* Analyst, 1959, **84**, 663-665.

The behaviour of Mn in a silicate analysis is considered, and it is shown to be distributed between the ammonia, oxalate, and phosphate precipitates. The ammonia-ammonium persulphate method, however, ensures the virtually complete precipitation of Mn with the metals of the iron group, leaving the Mg precipitate free from Mn.

R. A. H.

KLIVÉNYI (EVE). *The determination of the compositions of MnO_2 - Mn_2O_3 - Mn_3O_4 - $H_4BaMnMn_8O_{20}$ systems.* Acta Univ. Szegediensis, 1958, **11**, 3-10.

Details are given for the estimation of the pyrolusite, manganite, hausmannite, and psilomelane contents of sediments from a determination of the total MnO and active O content of the system at 20°C and at 600-650°C after igniting for three hours, and that of a separate sample after igniting it for three hours in a nitrogen current. [M.A. **13**-256, 268] R. A. H.

PECK (L. C.) & TOMASI (E. J.). *Determination of chlorine in silicate rocks.* Anal. Chem., 1959, **31**, 2024-2026, 1 fig.

The rock powder is sintered with a sodium carbonate flux containing ZnO and $MgCO_3$. The cake is leached with water, the solution is filtered, and the filtrate is acidified with nitric acid and titrated with mercuric nitrate solution using sodium nitroprusside as indicator. Triplicated results for 8 rocks are tabulated. R. A. H.

HUGUET (J. L.) & BAMBERGER (C. L.). *Rapid determination of beryllium in beryl mineral.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **3**, 595-597, 2 tables.

Sodium carbonate fusion is followed by direct precipitation of beryllium as beryllium ammonium phosphate. Results are reproducible to within 2% and are comparable with analyses by other methods. M. J. G.

AYDARKIN (B. S.), GORSHKOV (G. V.), GRAMMAKOV (A. G.), ZHADIN (V. S.), & KOLCHINA (A. G.). [*Determination of beryllium in ores by means of photoneutrons.* Trudy Radiiev. Inst., Akad. Nauk, SSSR, 1957, **5**, 89-93.] Anal. Abstr., 1958, **5**, abstr. 2534.

R. A. H.

ABRAHAMCZIK (E.) & MERZ (W.). *Bestimmung kleiner fluormengen in tonerdehaltigen Materialien.* Mikrochim. Acta, 1959, 445-455.

The specimen is fused with $K_2S_2O_7$ in a quartz flask having a side-arm which projects into the melt and through which a strong air blast is led to drive off the HF, which is absorbed in *N* NaOH. F is determined by titration with thorium nitrate solution with a mixed indicator of Na-alizarinsulphonate and methylene blue. F in ores may be rapidly determined down to 5 p.p.m. with a relative accuracy of 2 to 5%. R. A. H.

HALL (R. H.) & LOVELL (H. L.). *Spectroscopic determination of arsenic in anthracite coal ashes.* Anal. Chem., 1958, **30**, 1665-1669.

R. A. H.

CHOW (T. J.) & MCKINNEY (C. R.). *Mass spectrometric determination of lead in manganese nodules.* Anal. Chem., 1958, **30**, 1499-1503.

An isotopic dilution technique and surface ionization source mass spectrometer are combined to determine the isotopic composition and concentration of Pb in 16 Pacific Ocean manganese nodules. R. A. H.

MCCARTHY (H. J., Jr.) & STEVENS (R. E.). *Apparatus and technique for multiple tests by the confined spot method of colorimetric analysis. Application to field estimation of nickel and copper.* Anal. Chem., 1958, **30**, 535-538.

A soil sample (0.1g) is fused with potassium pyrosulphate and the melt dissolved. A novel tank arrangement controls the slow flow of sample solution through reagent paper allowing as little as 0.06 μ g Ni and 0.03 μ g Cu to be determined. The method has wide applicability to geochemical prospecting for many metals [M.A. **13**-75]. R. A. H.

HESFORD (E.). *The use of adsorption columns for effective precipitation separations.* A.E.R.E. (Harwell), 1957, Rept. C/M 222, 6 pp.

Fe can be separated completely from Al by passing solution through a column of activated carbon pre-treated with a 5-10% aqueous solution of triethanolamine, Al being retained on the carbon. The separation of Ni and Co and of U and Th are also discussed. R. A. H.

BROWNELL (G. M.), BRAMADAT (K.), KNUTSON (R. A.), TURNOCK (A. C.). *Induced radiation analysis for silicon, aluminium and sodium in igneous rocks.* Trans. Roy. Soc. Canada, Sect. IV, 1957, **51**, 19-31.

Coarsely crushed rock (300g samples) was subjected to fast neutrons to determine the Si content, thermal neutrons for the Al content, and slow neutrons for longer periods to determine the Na content. The accuracy was $\pm 1.75\%$ for SiO_2 , $\pm 0.9\%$ for Al_2O_3 , and $\pm 0.3\%$ for Na_2O . R. A. H.

NAZARENKO (I. I.). [*Determination of niobium and tantalum in ores.* Trudy Inst. Min., Geokhim. i Kristallografiya, Redk. Element., Akad. Nauk SSSR, 1957, 188-194.] Anal. Abstr., 1959, **6**, abstr. 131.

For the quantitative separation of Nb with tannin before its photometric determination in ores by the thiocyanate method it is expedient to use co-precipitation with gelatin. Results are given of the analyses of a large number of samples of minerals and ores. R. A. H.

VANDEN HERREWEGEN (F.). *Détermination rapide des proportions de wolframite, columbo-tantalite et cassitérite d'un concentré.* Bull. Acad. roy. Sci. Colon., Bruxelles, 1954, **25**, 476-485, 3 tables.

Wolframite is characterized by its yellow coloration and

eatment with aqua regia, and cassiterite is recognised by reaction with $\text{Zn} + \text{HCl}$. Quartz, garnet and variousicates can be distinguished by eye. Columbo-tantalite grains are bleached when treated with molten potash, followed by HCl attack: tantalite can be distinguished from columbite.

J. M.

UTLER (J. R.) & HALL (ROSEMARY A.). *The separation of total rare earths and thorium from some multiple-oxide minerals*. Analyst, 1960, **85**, 149–150, 1 fig.

A note endorsing the scope of the sulphur dichloride-chlorine method of decomposition [Smith, 1898, Journ. Amer. Chem. Soc., **20**, 289] for rare earth and other multiple oxide minerals such as the euxenite-polyerose series, samarskite, yttrotantalite, etc., and also ilmenite and ilmenorutile. Full analytical details are given for the decomposition of such minerals and for the separation of the rare earths and thorium. [M.A. **13**–573]

R. A. H.

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ARADA (Z.). *Chemical analyses of Japanese minerals (IV)*. Journ. Fac. Sci. Hokkaido Univ., ser. 4, 1959, **10**, 1–93.

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RIFFITH (J. W.). *A bibliography on the occurrence of uranium in Canada and related subjects*. Geol. Surv., Canada, 1956, Paper 56–5, 34 pp.

The bibliography deals almost entirely with Canadian publications but a few others are included. References are grouped according to location and subject. The section on 'Mineralogy and Geochemistry' contains 94 references.

R. J. T.

UTTRELL (GWENDOLYN W.). *Annotated bibliography on the geology of selenium*. Bull. U.S. Geol. Survey, 1959, **1019-M**, 867–972.

The geological occurrence, mineralogy, geochemistry, metallurgy, biological effects, production, and uses of selenium described in nearly 400 papers covering the years 1818–1957 appear in a list arranged alphabetically. K. S.

RAMETBAUR (AGNES B.). *Selected bibliography of andalusite, kyanite, sillimanite, dumortierite, topaz, and pyrophyllite in the United States*. Bull. U.S. Geol. Survey, 1959, **1019-N**, 973–1046.

The bibliography is a compilation of 566 references on the high-alumina minerals exclusive of clays. K. S.

HAMOT (E. M.) & MASON (C. W.). *Handbook of chemical microscopy, Vol. I. Principles and use of microscopes and accessories. Physical methods for the study of chemical problems*. 3rd edition. New York (J. Wiley & Sons, Inc.), 1958, xii + 502 pp., folding colour plate of Michel-Levy scale of retardation, 125 figs. Price \$14.00.

Reviewed A.M. **44**–204, 462, by A. A. LEVINSON.

A. C. H.

RUCHIN (L. B.). Translation in German by J. BARNITZHE from the Russian, A. SCHÜLLER, editor. *Grundzüge der Lithologie; Lehre von den Sedimentgesteinen*. Berlin (Akademie Verlag), 1958, 806 pp., 304 illustrations, 46 tables. Price DM. 56.

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DUPLAIX (S.). *Détermination microscopique des minéraux des sables*. 2nd edn. Paris & Liège (Librairie Polytechnique Ch. Béranger), 1958, 96 pp., 75 illustrations. Price 26s.

Reviewed A.M. **44**–903 by C. O. HUTTON.

BORCHERT (H.). *Ozeane Salzlagertstätten*. Berlin (Gebrüder Bornträger), 1959, viii + 237 pp., 27 text. figs. Price DM. 58.

Reviewed M.M. **32**–256 by F. H. Stewart.

BRAUNS (R.) [1861–1937]. *Mineralogie*. CHUDOBA (KARL F.). *Allgemeine Mineralogie*. Sammlung Göschel, Bd. 29. 10th edition. Berlin (Walter de Gruyter & Co.), 1958, 120 pp. Price DM. 3.60. *Spezielle Mineralogie*, Sammlung Göschel, Bd. 31/31a. 10th edition. Idem., 1959, 170 pp., 125 figs. Price DM. 5.80.

Reviewed M.M. **32**–260 by M. H. HEY.

FISHER (J. C.), JOHNSTON (W. G.), THOMSON (R.), & VREELAND (T., Jr.), editors. *Dislocations and mechanical properties of crystals*. New York (John Wiley & Sons), London (Chapman & Hall), 1957, xiv + 634 pp., 9 tables, 348 text-figs. Price (bound) 120s.

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FRONDEL (C.). *Systematic mineralogy of uranium and thorium*. Washington (U.S. Geol. Survey Bull. 1064), 1958, viii + 400 pp., 1 pl., 24 text-figs. Price (paper-cover) \$1.50.

Reviewed M.M. **32**–346 by J. E. T. HORNE.

HINTZE (CARL) [1851-1916]. *Handbuch der Mineralogie*. CHUDOBA (KARL F.). *Ergänzungsband II: Neue Mineralien und neue Mineralnamen (mit Nachträgen, Richtigstellungen und Ergänzungen)*. Berlin (Walter de Gruyter & Co.), 1955-9, Lief. 6-9, pp. 401-728. Price Lief. 6 & 7 DM. 22 each, Lief. 8 DM. 28, Lief. 9 DM. 26.

Reviewed M.M. 32-259 by M. H. HEY.

KERR (PAUL F.). *Optical mineralogy*. London (McGraw-Hill Book Co., Inc.), 3rd edn., xiv + 442 pp. Price 66s.

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KONTA (J.). *Jilové minerály Československa [Clay minerals of Czechoslovakia]*. Prague (Česk. Akad. Věd.), 1957, 319 pp., 165 figs., 65 tables. Price 35.50 Kčs.

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KRAUS (E. H.), HUNT (W. F.), & RANDELL (L. S.). *Mineralogy. An introduction to the study of minerals and crystals*. London (McGraw-Hill Book Co., Inc.), 5th edn., 1959, x + 686 pp. Price 70s.

Reviewed M.M. 32-259 by M. H. HEY.

ROSE (A. J.). *Tables et Abaques*. Paris (Centre National de la Recherche Scientifique), 1957, 141 pp. Price 1500 fr.

DURIF-VARAMBON (A.) & FORRAT (F.). *Tables numériques de $\sin \theta$ et de $\sin^2 \theta$* . Centre National de la Recherche Scientifique, Institut Fourier, Grenoble, France, 1958, 26 pp. Price 250 fr.

These two publications are reviewed in M.M. 32-255 by R. J. DAVIS.

HOHN (F. E.). *Elementary matrix algebra*. New York (The Macmillan Co.), 1958, xi + 305 pp. Price \$7.50.

Reviewed A.M. 44-691 by C. L. CHRIST.

SWINEFORD (A.), editor. *Clays and clay minerals. Proceedings of the 5th National Conference on clays and clay minerals, University of Illinois 1956*. Washington (National Academy of Sciences—National Research Council Publication 566), 1958, vii + 360 pp., 156 text-figs. and pls., 58 tables. Price \$4.50.

Reviewed M.M. 32-258 by R. C. MACKENZIE.

TWENEY (C. F.) & HUGHES (L. E. C.). *Chambers technical dictionary*. Edinburgh (W. & R. Chambers Ltd.), 3rd edition, 1958, viii + 1028 pp. Price 35s.

Reviewed M.M. 32-92 by M. H. HEY.

J. Ph.

BERRY (L. G.) & MASON (B.). *Mineralogy. Concepts, descriptions, determinations*. San Francisco & London (Freeman & Co.), 1959, xi + 629 pp., incl. 26 determinative tables, 34 tables, 262 text-figs. Price 56s., \$8.75.

Reviewed M.M. 32-352 by P. G. EMBREY. R. A. H.

GARRELS (R. M.). *Mineral equilibria at low temperature and pressure*. New York (Harper & Brothers), 1960, 254 pp., 88 figs. Price \$6.00.

GRIGGS (D.) & HANDIN (J.), editors. *Rock deformation*. Geol. Soc. America, Mem. 79, 1960, 430 pp., 150 figs., 40 pls. Price \$12.00.

HARTSHORNE (N. H.) & STUART (A.). *Crystals and polarising microscope. A handbook for chemists and others*. 3rd edition. London (Arnold), 1960, 576 pp., 339 figs. Price 80s. [M.A. 6-2, 11-181].

HURLBUT (CORNELIUS S., Jr.). *Dana's manual of mineralogy*. 17th edition. New York (John Wiley), 1959, 609 pp., Price \$11.50.

MOORHOUSE (W. W.). *The study of rocks in thin section*. New York (Harper & Brothers), 1959, 514 pp., 30 figs. Price \$8.00.

RAMACHANDRAN (V. S.) & GARG (S. P.). *Differential thermal analysis as applied to building science*. Roorkee (Central Building Research Inst.), 1959, 182 pp., 6 figs. Price 5 rupees.

SCHIEFERDECKER (A. A. G.), editor. *Geological nomenclature*. Gorinchem, Holland (J. Noorduijn en Zoon N.V.), 1959, xvi + 523 pp. Price 45 guilders.

In English with Dutch, French, and German equivalents. Composite alphabetical index.

SINKANKAS (J.). *Gemstones of North America*. New York (Van Nostrand), 1959, 675 pp. Price £5 12s. 6d. \$15.00.

WILSON (A. J. C.), editor. *Structure reports 1940-1950, vol. XIV*. Utrecht (International Union of Crystallography), 1959, viii + 215 pp. Price £3 8s.

WISSER (E.). *Relation of ore deposition to doming in the North American cordillera*. Geol. Soc. America, Mem. 77, 1960, 140 pp., 34 figs. Price \$4.00.

R. A. H.

CLAY MINERALS

AKRAVARTI (S. K.). *Studies on the electrochemical, viscometric and swelling characteristics of pure clay minerals and their mixtures.* Journ. Indian Soc. Soil Sci., 1958, 239-246.

Describes the methods for determination of zeta potentials of clays and the application of the results in evaluating the proportion of the various clay minerals in natural clays and in clay mixtures.
A. P. S.

R (KAMIL) & KEMPER (W. D.). *Estimation of hydrateable surface area of soils and clays from the amount of absorption and retention of ethylene glycol.* Proc. Soil Sci. Soc. America, 1959, 23, 105-110.

An equilibrium method is proposed for measuring hydrateable surface area. A bentonite-glycol mixture adjusts glycol vapour pressure in a desiccator so that about the layer of glycol is retained or absorbed on hydrateable surfaces of samples. Surface area is calculated from the weight of glycol in the sample.
C. D. J.

RIZO (A.) & TECILAZIĆ-STEVAŃOVIĆ (M.). [Application of the thermobalance for the quantitative analysis of clays. Bull. Soc. Chim., Belgrade, 1957, 22, 383.] Anal. Abstr., 1959, 6, abstr. 3996.

Thermogravimetric methods were used to investigate clays and kaolins. Good agreement was obtained between thermogravimetric, d.t.a., and X-ray methods, but chemical and rational analyses gave less satisfactory results.
R. A. H.

OSPŠIL (Z.). [Application of the first exothermic peak for the quantitative determination of kaolinite. Silikáty, 1959, 3, 36, 1 table, 2 figs.] Brit. Ceram. Abstr., 1959, abstr. 2005.

For the quantitative d.t.a. determination of kaolinite the endothermic peak between 500-600°C has hitherto been used. Variations in the heat of dehydration of kaolinites from various localities cause errors greater than 20%. In this paper the use of the height of the first exothermic peak for the determination of the kaolinite content is discussed. Experimental results show that in many cases this method gives more accurate results. It is possible that certain impurities may interfere with the determination.
A. G. C.

DE MUMBRUM (L. E.). *Exchangeable potassium levels in vermiculite and K-depleted micas, and implications relative to potassium levels in soils.* Proc. Soil Sci. Soc. America, 1959, 23, 192-194.

A new method for removing K from micas, without affecting crystallinity, is described. The nature of the K-depleted products was established by X-ray diffraction. Exchangeable K, determined as a function of total K in the vermiculites produced by the new method, was consistently low over wide ranges of total K.
C. D. J.

MORTENSEN (J. L.). *Adsorption of hydrolyzed polyacrylonitrile on kaolinites: II. Effect of solution electrolytes.* Proc. Soil Sci. Soc. America, 1959, 23, 199-202.

Adsorption of HPAN on kaolinite was increased by increase in concentration of solution electrolyte. Divalent cations were more effective than univalent cations. Anions capable of complexing lattice aluminium and/or decomposing the clay crystal diminished adsorption of HPAN.
C. D. J.

DIXON (J. B.). [Mineralogical analyses of soil clays involving vermiculite-chlorite-kaolinite differentiation. Thesis, Wisconsin Univ., 1958.] Brit. Ceram. Abstr., 1959, abstr. 1575.

Chiefly concerned with differentiating between these minerals by d.t.a.
A. G. C.

GUHA (S. K.) & SEN (SUDHIR). *Potentiometric and conductometric titration of minus two micron fraction of four Indian china clays.* Bull. Centr. Glass & Ceramic Res. Inst., 1958, 5, 109-111.

Potentiometric and conductometric titration curves are given for several Indian china clays, some of which are found to be kaolinitic, behaving like monobasic acid.
A. P. S.

AOMINE (S.) & JACKSON (M. L.). *Allophane determination in Ando soils by cation exchange capacity delta value.* Proc. Soil Sci. Soc. America, 1959, 23, 210-214.

When pre-treated by a mildly alkaline buffer, allophane, developed from rapidly weathered volcanic ash, gave c.e.c. greater by 100me/100g than when pre-treated by a mildly acid buffer. This difference permits analytical determination of allophane in whole soil samples or in separated colloids.
C. D. J.

JOHNS (W. D.) & TETTENHORST (R. T.). *Differences in the montmorillonite solvating ability of polar liquids.* Amer. Min., 1959, 44, 894-896, 1 table.

Re-expansion of montmorillonite, following cation saturation with Li, Zn, or K and heating to 300°C, varies according to whether water, glycerol, or ethylene glycol is used. No re-expansion is found with water and nearly complete

re-expansion is found with ethylene glycol. Glycerol yields quite varied re-expansions indicating the presence of two kinds of layers, and so is a better agent than the others in this kind of investigation.

B. H. B.

OKUDA (S.), TANAKA (N.), & INOUE (K.). [*Effect of adsorbed monovalent cations on the dehydration characteristics of kaolinite at various temperatures.* Yogyo Kyokai Shi, 1958, **66**, 299, 13 figs., 2 tables. In Japanese.] Brit. Ceram. Abstr., 1959, abstr. 1230.

The static dehydration of various ionic kaolinites in vacuum at temperatures up to 1000°C was studied. Attention was concentrated on the difference between the rate of removal of the water of hydration of adsorbed monovalent cations, and the rate of removal of lattice water at constant temperatures. Using Zettlitz and Kampaku kaolins (both highly mono-ionic) Li-, Na-, NH₄-, and Cs-kaolinites were obtained by neutralizing the acid at 28°C for 12 h. Water of hydration of the adsorbed cations was removed at temperatures lower than 150–200°C. The maximum rate of dehydration was observed in H-kaolinite and the amount of dehydrated water (except with NH₄-kaolinite) was in close correlation with the lyotropic series of the ions. It was confirmed that the lattice water was evolved at a temperature as low as 300°C. The adsorbed cations seemed to play some role in the process of removal of lattice water.

A. G. C.

ALEXANDRE (V.), GARCIA VICENTE (J.), & RODRIGUEZ PASCUAL (M. C.). *Modificación de las propiedades adsorbentes de los minerales arcillosos mediante tratamiento térmico y catión de cambio.* An. Edaf. Fis. Veg. 1958, **17**, 133–161, 20 figs., 29 tables.

The authors study the effect of thermal treatment and change of cation on the adsorption of acetic acid by clay minerals. Montmorillonite and halloysite with cations of strong electrostatic field, experience strong diminution of adsorbing power after thermal treatment at temperatures below that of the loss of water from the lattice; at that temperature the X-ray diagram shows very clearly the change of crystalline structure to that of mica. In samples saturated with cations of weak electrostatic field, thermal treatment does not cause diminution of adsorbing power until the mineral has lost its lattice water. In samples containing kaolinite and illite, the loss of adsorbing power always takes place at similar temperatures whatever the exchange cation. [M.A. 14–93]

M. F.-A.

GONZALEZ GARCIA (F.) & PEIRÓ CALLIZO (A.). *Activación de las arcillas sedimentarias de Lebrija.* An. Edaf. Fis. Veg., 1958, **17**, 679–712, 17 figs., 10 tables.

The authors studied the acid and thermal activation of

some sedimentary clays from Lebrija [M.A. 14–93]. D.t.a. curves, X-ray diagrams, and electron microscopical photographs were prepared for samples treated with concentrations between 2% and 20%, and at temperatures between 95° and 440°C. It is concluded that attapulgite is more resistant to acid treatment than illite. The treatment resulted in decrease in the adsorption capacity of the clays. [See previous abstract.]

M. F.-A.

GALVÁN (J.), MARTÍN DE LOS RÍOS (M.), & AMORÓS (J.). *Contribución al estudio de los minerales españoles. Caracterización roentgenográfica de las sepiolites.* Real Soc. Esp. Hist. Natur., 1958, **56**, 427–444, 14 figs., 13 tables.

The authors make a critical analysis of the A.S.T. diagrams and of data in the literature of the sepiolites. They find a number of discrepancies such as the presence of a very intense line at $12.1 \pm 0.2\text{\AA}$ in the diffraction pattern of some sepiolites but not of others. A systematic study of Spanish sepiolites shows that the very strong line at $12.1 \pm 0.2\text{\AA}$ is characteristic and a strong line at 3.55\AA is typical. Spanish sepiolites are accompanied by quartz, calcite or dolomite, and sometimes gypsum.

M. F.-A.

JARVIS (N. L.), ELLIS (R., Jr.), & BIDWELL (O. W.). *Chemical and mineralogical characterization of selected Brunizem, Reddish Prairie, Grumusol, and Planosol soils developed in pre-Pleistocene materials.* Proc. Sci. Soc. America, 1959, **23**, 234–239.

Chemical and physical properties reflected the influence of parent materials. Weathering of clay minerals was limited to three types: formation of interstratified minerals in the poorly drained Summit soils; breakdown of certain illitic minerals into smaller particle sizes; and formation of vermiculite from 2:1 minerals capable of expanding to 17\AA when treated with glycerol.

C. D. J.

FUSARINI (E.). [*Recent theory on ion exchange and development of an electric charge on particles in kaolinite—water system.* Ceramica, Milano 13, 1958, no. 12, 61, 1 table, 2 figs.] Brit. Ceram. Abstr., 1959, abstr. 1225.

Refers to the theory of W. G. Lawrence.

A. G. C.

GUHA (S. K.) & SEN (SUDHIR). *A study of base-exchange property of Indian clays.* Bull. Cent. Glass & Ceram. Res. Inst., 1958, **5**, 60–65.

Details of base exchange properties of some Indian clays are given, and the effect of the concentration of clay on the nature of the potentiometric and conductometric titration curves is discussed.

A. P. S.

WOLL (DOROTHY). *Ion exchange in clays and other minerals*. Bull. Geol. Soc. America, 1959, **70**, 749-780.

A review of ion exchange in clays and other minerals. Exchange reactions are restricted by the number of exchange sites on the mineral and by the strength of the binding of the exchangeable cations to the mineral surface. Each clay mineral has a range of exchange capacities, measured in chemical equivalents of base adsorbed at pH7, because of difference in structure and chemical composition. Ranges of exchange capacities are given, and the order of replaceability of the common cations is stated and discussed. Other exchange phenomena reviewed are anion exchange, adsorption of cations and anions by clay minerals, effect of environment on cation exchange, and the exchange capacity of zeolites, of rocks, of other minerals, of organic matter and organic complexes, and of amorphous mineral material.

A. L. A.

ROVINSKY (R. L.). [*Mineralogical variation of Wyoming bentonites and its significance*. Thesis, Univ. Illinois, 1958.] Brit. Ceram. Abstr., 1959, abstr. 858.

The most notable variation is in the types of cations on the exchange site; it is suggested that the initial cation adsorbed on an exchange site of a given platelet may govern the type of cations that can be adsorbed on the remaining sites of the platelet.

A. G. C.

WHITE (W. ARTHUR) & PICHLER (ERNESTO). *Water-sorption characteristics of clay minerals*. Circ. Illinois State Geol. Survey, 1959, **266**, 20 pp.

Montmorillonite adsorbs more water than the other clay minerals. Chlorites and illites have similar water-sorption properties. Mixtures of clay minerals and mixtures of clay minerals with sand tend to have water-sorption values proportional to the percentage of clay mineral present.

D. H. S.

YUZUMI (MITSUE) & ROY (RUSTUM). *Synthetic montmorillonoids with variable exchange capacity*. Amer. Min., 1959, **44**, 788-805, 6 figs., 6 tables.

Montmorillonoid gels of saponite and beidellite compositions were treated in sealed inert systems over the range 0°-850°C at 1000 atm. water pressure. Beidellites were synthesized with exchange capacities varying from $\frac{1}{2}N$ to greater than $2N$ where N represents the 'ideal' of 90 me., corresponding to 0.17 mols Na_2O in the aluminosilicate formula. These beidellites are stable for weeks at 300°C and 1000 atm.; the N composition is the only one stable up to 425°C. Only the N and $2N$ members of the saponites can be prepared; they are stable up to 550°C; above this temperature a Na-hectorite montmorillonoid is formed

which is stable to 850°C. Cation exchange capacities were measured by the X-ray fluorescence of Mn-saturated samples.

B. H. B.

GILLERY (F. H.). *Adsorption-desorption characteristics of synthetic montmorillonoids in humid atmospheres*. Amer. Min., 1959, **44**, 806-818, 1 fig., 5 tables.

The desorption characteristics of 12 synthetic and 4 natural Na- and Ca-beidellite or saponite samples with cation exchange capacities of $\frac{1}{2}N$, N , $2N$, and $2\frac{1}{2}N$ have been measured [see preceding abstract]. Generally two well-crystallized hydrates exist over shorter or longer intervals of relative humidity, and in the range between these intervals mixed layers of the hydrates occur. Variation in the exchange capacity or in the type of montmorillonoid has little effect on the desorption characteristics but in Ca samples the stability range of the one-layer hydrate is decreased and that of the two-layer hydrate is increased relative to Na-saturated samples. Sixteen basal spacing-relative humidity diagrams are given.

B. H. B.

SHEARER (J.). *Clay mineral studies*. Curr. Sci., 1958, **27**, 198-201.

A brief discussion on the structure of various clay minerals is followed by diagnostic basal spacings for five groups with layer structures (a) after glycerol treatment, and (b) after heat treatment at 600°C.

A. P. S.

WORRALL (W. E.). *Rational analysis of fireclays*. Trans. Brit. Ceram. Soc., 1959, **58**, 145-153.

A Yorkshire fireclay was separated into 7 fractions of particle size from 0.075 to $>36\mu$ and analysed. The usual methods of calculating the rational analysis on the assumptions that the fireclay mineral is kaolinite and that the alkalis are present as feldspar or mica are shown to be unsound. A method is proposed based on the combined H_2O content for the computation of the clay mineral, which is shown to have a lower Al_2O_3 content than kaolinite, the deficiency being made up by the substitution of Fe_2O_3 and MgO .

R. A. H.

TRASK (PARKER D.). *Effect of grain size on strength of mixtures of clay, sand, and water*. Bull. Geol. Soc. America, 1959, **70**, 569-580, 9 figs.

The strength of soil was investigated by measuring the strength of a series of synthetic soils in which the water content, clay type, clay-sand ratio, and grain size of admixed sand were changed from one experiment to another. For given water content, kaolin and illite are essentially equal in strength, and both are much weaker than montmorillonite. For all clays the strength increases, for given water content and given grain size of the sand, as

the ratio of clay to sand increases. For given water content and given clay-sand ratio, the strength increases as the grain size of the sand decreases below 135 microns. For coarse sand, variation of grain size has little effect. The greater strength with increasingly fine sand is ascribed to the greater surface area upon which forces can act.

A. L. A.

CHAKRAVARTI (S. K.). *Studies on the electrochemical, viscometric and swelling characteristics of pure clay minerals and their mixtures.* Journ. Indian Soc. Soil. Sci., 1958, 239-246.

Describes the methods of determination of zeta potentials of clays, and their application to determination of the proportion of clay minerals in natural clays and clay mineral mixtures.

A. P. S.

BASSETT (W. A.). *The origin of the vermiculite deposit at Libby, Montana.* Amer. Min., 1959, 44, 282-299, 10 figs., 3 tables.

The largest vermiculite mine in the U.S.A. is at Libby, Montana. The deposit is in a pyroxenite stock intruded into sediments of the Belt Series. Two stages of alteration are postulated: hydrothermal alteration of augite to biotite which is related to the intrusion of an adjacent body of syenite, followed by supergene alteration of biotite to hydrobiotite and vermiculite. Biotite alters to vermiculite at room temp. in solutions of .001M $MgCl_2$ and $CaCl_2$ in several days; concentrations of .04MK inhibit the alteration. An analysis of the vermiculite concentrate is given.

B. H. B.

PARHAM (WALTER E.). *Light-burning clay resources in LaSalle County, Illinois.* Circ. Illinois State Geol. Survey, 1959, 277, 27 pp.

Information on the drying, firing shrinkage, water of plasticity, burning colour, refractoriness, banding properties and possible uses of the clays is given. W. A. Wh.

ROBERTSON (R. H. S.). *Formation of clay minerals.* Clay Min. Bull., 1955, 2, 304-306.

A concise review of the methods of and conditions for formation of clay minerals in the field and in the laboratory.

R. C. M.

HARRISON (J. L.). [*Clay mineral stability and genesis during weathering.* Thesis, Indiana University, 1958.] Brit. Ceram. Abstr., 1959, abstr. 856.

X-ray diffraction and chemical studies were carried out on two weathered shales, the profiles of which extended from fresh unweathered shale at the bottom to highly

weathered material at the top. These were compared with three shale underclay profiles. Montmorillonite is formed at the expense of chlorite. Illite is also converted to montmorillonite, by formation of a mixed-layer illite-montmorillonite complex; this type of mixed-layer is reflected in the diffraction patterns by asymmetry on the low-angle side of the 001 peak and on the high-angle side of the 002 peak of illite, and by broadening of the 002 peak.

A. G. C.

BROPHY (JOHN A.). *Heavy mineral ratios of Sangamon weathering profiles in Illinois.* Circ. Illinois State Geol. Survey, 1959, 273, 22 pp.

Heavy mineral ratios were studied to compare the weathering attained in two buried profiles developed in clayey Illinoian till with that in two profiles developed in sand and gravelly Illinoian outwash. The profiles have similar topographic positions so that differences in soil-forming factors, other than texture of parent material, probably were not great. In the zone of greatest weathering about 90% of the hornblende and 70% of the garnet have been removed from the outwash whereas only about 60% of the hornblende and very little of the garnet had been removed from the till. In the till profiles the illite and chlorite were almost completely altered to montmorillonite.

W. A. Wh.

GROSSMAN (R. B.), STEPHEN (I.), FEHRENBACHER (J. B.), BEAVERS (A. H.), & PARKER (J. M.). *Fragipan soils in Illinois: II. Mineralogy in reference to parent material and uniformity of Hosmer silt loam.* Proc. Soil Sci. Soc. America, 1959, 23, 70-73.

C. D. J.

JOHNSON (P. R.) & BEAVERS (A. H.). *A mineralogical characterization of some loess-derived soils in Illinois.* Proc. Soil Sci. Soc. America, 1959, 23, 143-146.

X-ray diffraction of the fine silt fraction indicates progressive increase in quartz and decrease in feldspar content as the A horizons of loessial soils develop. No significant change in the quartz and feldspar content of the coarse silt fraction was found.

C. D. J.

THORP (J.), CADY (J. G.), & GAMBLE (E. E.). *Genesis of Miami silt loam.* Proc. Soil Sci. Soc. America, 1959, 23, 156-161.

C. D. J.

STROBBE (P. C.) & WRIGHT (J. R.). *Modern concepts of the genesis of podzols.* Proc. Soil Sci. Soc. America, 1959, 23, 161-164.

It is suggested that Fe and Al are moved as soluble metal-organic complexes.

C. D. J.

MALEB (S. B.). *The genesis of the Red-Yellow Podzolic soils*. Proc. Soil Sci. Soc. America, 1959, **23**, 164-168. Mineralogical, chemical, physical, and morphological data presented for eighteen representative profiles of Red-low Podzolic soils.

C. D. J.

ERMAN (G. D.) & ALEXANDER (L. T.). *Characteristics and genesis of Low Humic Latosols*. Proc. Soil Sci. Soc. America, 1959, **23**, 168-170.

soils of the Low-Humic Latosol group have developed in basic crystalline materials in relatively dry tropical zones. Profiles of these soils are characterized by red, pur, weak A₁ horizons, low organic matter, high kaolin, silica: sesquioxide ranging from 1.1 to 1.7. C. D. J.

LINCK (M.) & DEKEYSER (W.). *Le gisement d'halloysite de Blaton*. Bull. Soc. belge Géol., 1957, **66**, 381-388, 3 figs., 1 pl.

A description of the deposit and the results of X-ray and electron-microscope study of the material are given. It appears that all the forms transitional between kaolinite and halloysite can coexist in the deposit. F. Sch.

ERTIN VIVALDI (J. L.) & PINO VAZQUEZ (C. DEL). *Estudio mineralógico de una 'Tierra Blanca' de Zarza de Alanje (Badajoz)*. Notas y Comunicaciones Inst. Geol. Min. España, 1958, **49**, 5-23, 5 figs., 8 tables.

A commercial clay (Tierra Blanca, Jabonita) from Zarza Alanje (Badajoz) was investigated by chemical and volumetric analysis, and by d.t.a. dehydration curves, X-ray diffraction, and electron-microscope techniques. The clay is a mixture of about 20% mica, 30% kaolin and 50% pyrophyllite with feldspar, quartz, and anatase in small amounts. On account of its chemical and mineralogical composition the possibility of its use in ceramics is suggested. M. F.-A.

GONZALEZ GARCIA (F.) & PEIRÓ CALLIZO (A.). *Constitución y propiedades de las arcillas sedimentarias de Lebrija*. An. Edaf. Fis. Veg., 1958, **17**, 603-667, 23 figs., 23 tables.

The sedimentary clays from Lebrija belong to the Tertiary Pliocene. The authors have studied a white, industrial clay, and a dark clay, known as 'tierra de vino'—by chemical analysis, c.e.c. determinations, dehydration and d.t.a. curves, X-ray diagrams and electron microscope photography. It is shown that the white clay is composed of a mixture of illite and attapulgite, 50% of each; some particles of mica, rare, tiny crystals of kaolinite, and some quartz and calcium carbonate are also present. The dark clay is composed fundamentally of a very altered and dehydrated illite which is a transition stage between illite

and montmorillonite, very near to the montmorillonoid minerals; the presence of attapulgite was not detected. [See following abstract.] M. F.-A.

GONZALEZ PEÑA (J. M.). *Estudio mineralógico comparativo de la fracción arcilla de algunos sedimentos del litoral español*. An. Edaf. Fis. Veg., 1958, **17**, 27-49, 3 pl., 7 figs., 10 tables.

The author studied the mineralogical composition of the clay fraction in two sets of samples comprising eight samples from the Galician coast, and six from the Andalusian coast. Identification was carried out by dehydration curves, d.t.a., and electron microscopy. The sediments of the Andalusian coast are much richer in fine fractions, especially clay, than those of the Galician coast. There is no measurable variation in the composition with depth. Both sets of samples possess a high proportion of illite to kaolinite and in greater proportion halloysite, quartz, and iron and aluminium gels were found in both sets. M. F.-A.

FICAI (C.) & CORADUCCI (P.). [*Identification and study of an Italian halloysite clay mineral and its ceramic properties*. Ceramica, 1958, **13**, no. 8, 45, 8 figs.] Brit. Ceram. Abstr., 1958, abstr. 625.

The rock studied, from Monte Amiata (Grosseto), was shown by chemical, mineralogical, microscope, X-ray, and d.t.a. investigations to have a halloysitic clay fraction.

A. G. C.

OBERLIN (A.) & FREULON (J.-M.). *Étude minéralogique de quelques argiles des séries primaires du Tassili N'Ajjer et du Fezzan (Sahara central)*. Bull. Soc. franç. Min. Crist., 1958, **81**, 186-189, 3 figs.

Examination of Palaeozoic clays from the central Sahara [25°N., 9°E.] shows that well-crystallized kaolinite is associated with a continental origin while poorly formed crystals correspond to marine deposition. R. A. H.

HOYOS (A.) & RODRIGUEZ (J.). *Propiedades y estudio genético de arcillas sedimentarias de Guinea Continental Española*. An. Edaf. Fis. Veg., 1958, **17**, 323-340, 1 pl., 4 figs., 8 tables.

A clayey conglomerate of marine origin, from Continental Spanish Guinea, is formed of materials of different colours: grey, yellow, reddish, and violet. Thermal treatment at 70°C and 45°C in slightly acidulated water, causes the following transformations in a relatively short time: grey clay → yellow clay → reddish clay; yellow clay → reddish clay; reddish clay → violet clay. X-ray study, d.t.a., and electron-microscope analysis show that the components of

the clays are illite, metahalloysite, and quartz in various proportions. The transformation is illite \rightarrow metahalloysite \rightarrow quartz, in slightly acid conditions and absence of calcium.

M. F. A.

KARYAKIN (L. I.). [*Mineralogical composition of the secondary kaolin from Novoselitskiĭ deposit. Ogneuporĭy*, 1958, **23**, 268, 1 fig.] Brit. Ceram. Abstr., 1959, abstr. 348.

A. G. C.

RAO (A. V. R.) & ALI (A.). [*Study of mineral constituents of Hyderabad clays by differential thermal analysis. I. Preliminary studies. Trans. Indian Ceram. Soc.*, 1958, **17**, 39, 6 figs., 3 tables.] Brit. Ceram. Abstr., 1959, abstr. 1231.

Kamthana, Shekapur, and Pacheagon clays were of the kaolinitic type. Srirangapur clay contained mainly Ca-montmorillonite with a small proportion of kaolinite.

A. G. C.

LOUGHNAN (F. C.) & GOLDING (H. G.). *The mineralogy of the commercial dyke clays in the Sydney district, N.S.W.* Journ. & Proc. Roy. Soc., New South Wales, 1957, **91**, 85-91, 8 figs., 2 tables.

Residual clays formed by the extensive leaching of Tertiary dykes in the Sydney district are predominantly kaolinitic, though up to 30% of illite is frequently present. The clays contain up to 5.9% TiO_2 , much of which occurs as distinctive leucoxene octahedra, believed to be pseudomorphous after titaniferous magnetite. Illite is associated with the leucoxene.

A. G. C.

CHEN (P. Y.). *Clay deposits and their mineral composition in north-western Taiwan.* Proc. Geol. Soc. China [Formosa], 1959, no. 2 (for 1958), 93-121, 3 figs., 2 pls.

Samples were collected from 115 clay deposits and investigated by petrographic, X-ray powder diffraction, d.t.a., and electron-micrographic methods. The clays derived from the alteration of andesite or agglomerate consist of kaolinite and halloysite in various proportions and are of commercial value. The clays from Miocene and Pleistocene sediments are mainly composed of kaolinite and illite in nearly equal amounts, and a washed clay derived from white sandstone mainly consists of lath-shaped illite. The results of 42 chemical analyses of clays are tabulated, and the distribution of non-clay minerals in the clays is listed.

R. A. H.

KELLER (W. D.), WESTCOTT (J. F.), & BLEDSOE (A. O.). *The origin of Missouri fire clays.* Proc. 2nd Nat. Conf. Clays & Clay Min., Nat. Acad. Sci.-Nat. Res. Council Publ. 327, Washington, 1954, 7-44, 4 figs.

Fireclays in the Cheltenham formation (Pennsylvania) in the east central part of the State of Missouri range in refractory quality from semi-plastic, intermediate-clay fireclay through high-heat-duty clays and flint clays, boehmite and diaspore clays. Chemical analyses of 5 types of clay show that SiO_2 ranges from about 4% (diaspore clay) to 56% (plastic 'foundry' clay). Mineralogically there are two facies of clay, diaspore-boehmite, and kaolinite-illite. The clays were deposited on an eroded limestone land surface and were later covered by a younger massive limestone (Ft. Scott limestone). The diaspore-boehmite facies developed through strong leaching of clay in karst type depressions, whereas the kaolinite-illite facies, deposited near the margin of a slowly sinking deposition area, was not leached. Evidence points to a negative Eh and an acid environment during formation. The presence of diaspore and boehmite and the absence of gibbsite, are interpreted as indicating leaching of clay minerals under water-logged conditions.

D. C.

POWERS (M. C.). *Clay diagenesis in the Chesapeake Bay area.* Proc. 2nd Nat. Conf. Clays & Clay Min., Nat. Acad. Sci.-Nat. Res. Council Publ. 327, Washington, 1954, 68-80, 3 figs.

Rivers discharging into the Chesapeake Bay area carry illite and degraded illite with minor quantities of kaolinite and degraded chlorite. Montmorillonite is rare. It is considered that a chlorite-like clay mineral forms in the sediments of the Chesapeake Bay estuaries by the diagenesis of degraded illite.

D. C.

MURRAY (H. H.). *Genesis of clay minerals in some Pennsylvanian shales of Indiana and Illinois.* Proc. 2nd Nat. Conf. Clays & Clay Min., Nat. Acad. Sci.-Nat. Res. Council, Publ. 327, Washington, 1954, 47-53, 6 figs.

This paper gives chemical and mineralogical analyses of shales of marine, brackish water, and non-marine origin from cyclothems of Pennsylvanian age. Average compositions show that marine and non-marine shales cannot be distinguished chemically. The distribution of trace elements, Cr, Ni, Co, V, Mn, Sc, Sr, and Ba is tabulated. Only V, Cr, and Ba showed significant variation in average values among the three environments. V is highest in shales high in organic matter deposited under brackish water conditions. The clay minerals of the shales are illite, kaolinite, and chlorite. The illite to kaolinite-chlorite ratio is highest in marine, and lowest in non-marine shales. Some clay minerals in the shales are detrital, but the majority probably have formed authigenically from skeletal aluminium silicate structures and from silica and alumina colloids.

D. C.

ONS (L. H.) & TAGGART (M. S., Jr.). *Clay mineral content of Gulf Coast outcrop samples*. Proc. 2nd Conf. Clays & Clay Min., Nat. Acad. Sci.-Nat. Res. Council Publ. 327, Washington, 1954, 104-110, 3 figs.

The minerals in samples of clay taken from various geological formations between Corpus Christi and Uvalde, Texas, were identified by X-ray diffraction and electron microscopy. Montmorillonite, kaolinite, and illite are the dominant minerals, but palygorskite (attapulgite) occurs in one formation (Lissie fm., Pleistocene). The abundance of montmorillonite is related to alteration of volcanic ash. Chlorite or vermiculite was found. D. C.

IM (R. E.) & JOHNS (W. D.). *Clay mineral investigation of sediments in the northern Gulf of Mexico*. Proc. 2nd Conf. Clays & Clay Min., Nat. Acad. Sci.-Nat. Res. Council Publ. 327, Washington, 1954, 81-102, 7 figs.

Clay minerals identified by X-ray diffraction are listed for sediment samples from the Guadalupe River, its delta, and a number of bays in the vicinity of Rockport, Texas. The river transports mainly montmorillonite with some illite and chlorite. In the bays montmorillonite decreases and illite and chlorite increase, suggesting that the latter form from montmorillonite in brackish and salt water. In the open Gulf of Mexico montmorillonite occurs in greater amounts than in the minor bays and estuaries. Glauconite is found in the coarser fractions of the open Gulf samples. Chemical analyses are given for 10 clay samples from various environments. The cations in the interstitial water of each sample were determined, and Na/Mg and Na/K ratios computed for each environment. It is considered that the major diagenetic change in clays is the development of illite and chlorite from montmorillonite.

D. C.

CRYSTAL STRUCTURE OF MINERALS

ENFINK (H.) & SANS (F. J.). *Refinement of the crystal structure of dolomite*. Amer. Min., 1959, **44**, 679-682.

Structure parameters of dolomite were redetermined as: x 0.2374, y 0, z 0.2440, and C : z 0.2435 leading to interatomic distances $C-O = 1.283$; $Mg-O = 2.095$; $-O = 2.390\text{\AA}$. A. C. H.

SENZWEIG (ABRAHAM) & FINNEY (JOSEPH J.). *The unit cell of carminite*. Amer. Min., 1959, **44**, 663-665.

Indexed X-ray powder data are listed. The unit cell values are a 12.25, b 16.52, c 7.64 all $\pm 0.04\text{\AA}$, cell volume 28.8 \AA^3 , cell weight 50.46, cell formula $Pb_8Fe_{16}(AsO_4)_{16}(OH)_{16}$. Measured sp.gr. 5.03 to 5.18, calculated 5.46; space group $Im\bar{3}m$ or $A2aa$ (C_{2v}^{13} or D_{2h}^{20}). A. C. H.

ROSS (VIRGINIA) & EDWARDS (J. O.). *Tetrahedral boron in teepelite and bandylite*. Amer. Min., 1959, **44**, 875-877, 2 tables.

In teepelite, $Na_2B(OH)_4Cl$, and bandylite, $CuB(OH)_4Cl$, the presence of discrete tetrahedral $B(OH)_4$ ions has been deduced from X-ray analyses. X-ray powder data are given for these two minerals. The Na or the Cu ion respectively octahedrally coordinated by four nearest neighbour oxygen atoms and two chlorine ions. The tetrahedral (OH) configuration about B has been confirmed by infra-red and clear quadrupole resonance studies. B. H. B.

MARK (JOAN R.) & CHRIST (C. L.). *Studies of borate minerals (V): Reinvestigation of the X-ray crystallography of ulexite and probertite*. Amer. Min., 1959, **44**, 712-719, 5 tables.

Crystals of ulexite, $NaCaB_5O_9 \cdot 8H_2O$, and probertite, $NaCaB_5O_9 \cdot 5H_2O$, have been studied by X-ray precession methods and earlier findings are confirmed. The crystal elements for ulexite are: triclinic, space group $P\bar{1}-C_1^1$, a 8.809 ± 0.02 , b 12.86 ± 0.04 , c $6.678 \pm 0.02\text{\AA}$, α $90^\circ 15'$, β $109^\circ 07'$, γ $105^\circ 05'$ (all $\pm 05'$), $Z=2$; the reciprocal elements are also given. Probertite is monoclinic, with space group $P2_1/a-C_{2h}^5$, a 13.43 ± 0.04 , b 12.57 ± 0.04 , c $6.589 \pm 0.02\text{\AA}$, β $100^\circ 15' \pm 05'$. Indexed powder patterns are given for both minerals and all calculated interplanar spacings for $d \geq 2.5\text{\AA}$. B. H. B.

FRUEH (A. J., Jr.). *The crystallography of petzite, Ag_3AuTe_2* . Amer. Min., 1959, **44**, 693-701, 5 figs., 3 tables.

The space group of petzite, Ag_3AuTe_2 , from Buerger precession data was determined to be cubic $I4_132$ with a cell edge of 10.38\AA ; a unit cell contains eight formula weights. The atoms are located as follows: 24 Ag atoms on x , 0, $\frac{1}{2}$, etc., with $x = .365$; 8 Au atoms on $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{8}$, etc.; 16 Te atoms on x , x , x , etc., with $x = .266$. An indexed table of observed and calculated X-ray reflections is given. A high temperature form of petzite exists at 250°C and limited hessite-petzite solid solubility may exist at this temperature.

B. H. B.

CARIĆ (S.). *Amélioration de la structure de la humboldtine $FeC_2O_4 \cdot 2H_2O$* . Bull. Soc. franç. Min. Crist., 1959, **82**, 50-56, 5 figs.

The structure of the hydrated iron oxalate, humboldtine, determined by Mazzi and Garavelli [Periodico Min. Roma, 1957, **2**, 269] has been further refined. Humboldtine is

monoclinic, space group $C2/c$, with a 12.060, b 5.550, c 9.804 Å; β 127°58'; $Z=4$. The C_2O_4 groups are linked to Fe atoms forming chains along the b axis. R. A. H.

DURIF (A.) & FORRAT (F.). *Gallates et aluminates isomorphes de la géhlénite*. Bull. Soc. franç. Min. Crist., 1958, **81**, 107–109, 1 fig.

Gallates and aluminates of the formula $CaTM_3O_7$ have been prepared, with $M=Al$ or Ga and $T=La, Pr, Nd, Y$, or Sm . These compositions may be compared with gehlenite, $Ca_2Al_2SiO_7$, with the double substitution $Si+Ca=Al$ +rare earths. X-ray powder patterns show that total substitution of the Si is possible without any structural change. R. A. H.

MUKHERJEE (BIBHUTI). *X-ray study of psilomelane and cryptomelane*. Min. Mag., 1959, **32**, 166–171.

Psilomelane from manganese ores of the Jhabua and Ratanpur deposits, Bilaspur, Madhya Pradesh, containing 10 to 15% BaO, is orthorhombic with a 8.254, b 13.40, c 2.864 Å; the indexed X-ray powder data are tabulated and indicate the space group $P2_12_12(D_2^2)$, $Z=1$. The indexing is not satisfactory using the axes given by Vaux [M.M. 24–521] for the original psilomelane. A number of earlier described psilomelanes [Fermor, 1909] are shown to be cryptomelane, and to have a body-centred tetragonal cell with a 9.822, c 2.858 Å, $Z=1$ [M.A. 8–310]. Fermor's stalactitic 'psilomelane', from Garbham, Vizagapatam, has an inner core of cryptomelane and an outer fine-grained crust of pyrolusite (a 4.382, c 2.855 Å). The monoclinic symmetry of hollandite [M.A. 11–99, 238] has been confirmed. [M.A. 9–4, 12–93, 328, 14–395] R. A. H.

BARRER (R. M.) & KERR (I. S.). *Intracrystalline channels in levynite and some related zeolites*. Trans. Faraday Soc., 1959, **55**, 1915–1923, 8 figs., 1 pl.

The structure of levynite consists of alternate layers of hexagonal prisms, made of two parallel rings of six $(Al, Si)O_4$ tetrahedra linked by six oxygen bridges, and of single six-membered rings. Levynite from Breiddalur, Iceland, has a 10.75 Å, α 76°25', space group $R\bar{3}m$, with 3 units of composition approaching $Ca(Al_2Si_4O_{12})6H_2O$ in each rhombohedral cell. On the basis of the crystallographic data, diffusion anisotropy and molecular sieve behaviour of the chabazite, gmelinite, and erionite types of framework have been studied and the channel systems are described and compared. R. A. H.

LINDBERG (M. L.) & CHRIST (C. L.). *Crystal structures of the isostructural minerals lazulite, scorzalite and barbosalite*. Acta Cryst., 1959, **12**, 695, 1 fig.

The isostructural minerals lazulite, scorzalite, and barbosalite are all monoclinic $P2_1c$ with a 7.16, 7.15, 7.25; b 7.31, 7.46; c 7.24, 7.25, 7.49 Å; β 120°40', 120°35', 120° sp. gr. 3.12, 3.33, 3.60 respectively. Chemical analyses [M.A. 11–244] show that lazulite, from Minas Gerais, Brazil, has a cell content of $Fe_{0.23}Mg_{1.27}Al_4(PO_4)_4(OH)_4$, scorzalite $Fe_{1.53}Mg_{0.47}Al_4(PO_4)_4(OH)_4$, and the barbosalite $Fe_2Fe^{3+}_4(PO_4)_4(OH)_4$. The structure involves three dimensional linkage of metal ion–oxygen octahedra and phospho-tetrahedra. [M.A. 10–254, 507, 12–408, 13–85] J.

PABST (A.). *Structures of some tetragonal sheet silicates*. Acta Cryst., 1959, **12**, 733, 2 figs.

Synthetic $CaCuSi_4O_{10}$ (Egyptian blue), $SrCuSi_4O_{10}$, $BaCuSi_4O_{10}$ have structures similar to that of gillespite $BaFeSi_4O_{10}$ [M.A. 9–45]. All are tetragonal $P4/ncc$ and in the order listed above they have a 7.30, 7.37, 7.44, 7.50 Å; c 15.12, 15.57, 16.11, 16.07 Å; sp.gr. 3.06, 3.32, 3.47, 3.58. The three synthetics have ω 1.636, 1.628, 1.632, and ϵ 1.1588, 1.593, and dichroism is ω blue, ϵ pale pink to colorless. While gillespite is easily attacked by HCl, the copper analogues are highly acid resistant. The mineral curvite is probably the natural analogue of 'Egyptian blue'. [M.A. 7–225, 470] J.

ROOYMANS (C. J. M.). *A new type of cation-vacancy order in the spinel lattice of In_2S_3* . Journ. Inorg. Nuclear Chem., 1959, **11**, 78–79.

R. A. H.

HARRIES (H. J.) & MORRIS (D. F. C.). *The lattice energies of alkaline earth fluorides*. Acta Cryst., 1959, **12**, 100–104. CaF_2 , SrF_2 , and BaF_2 are considered. J.

DORNBERGER-SCHIFF (K.) & HÖHNE (E.). *Die Kristallstruktur des Betehtinit $Pb_2(Cu, Fe)_{21}S_{15}$* . Acta Cryst., 1959, **12**, 646, 3 figs.

Betekhtinite is orthorhombic $Immm$, $Z=2$, with a 30.1, b 14.67, c 22.80 Å. Structure determination by Patterson and Fourier methods shows that the lead atoms are surrounded by six sulphurs at the corners of a triangular prism and that some copper atoms are in tetrahedral and some in triangular (three-fold) coordination. Some of the tetrahedrally coordinated copper sites are statistically occupied. Before this structure determination, the formula of betekhtinite was incorrectly taken as $Pb_2(Cu, Fe)_{21}S_{15}$. [M.A. 13–85] J.

BROWN (W. L.). *The effect of heat treatment on the structure in the plagioclases in relation to changes in lattice angles*. Amer. Min., 1959, **44**, 892–894, 1 ta.

Heat treatment of two plagioclase samples at 1140°C

periods of from 0.25 to 70 days changes the reciprocal lattice angles α^* , γ^* and $(010)/(\bar{1}01)$, and causes weak split type-(b) reflections, in precession photographs, to merge and then fade as the heating time is extended. From the shorter to the longer period of heating, for andesine An_{36} , α^* increased about 12', γ^* decreased about 20', and $(010)/(\bar{1}01)$ increased about 35'; for labradorite An_{50} , α^* was insignificantly changed, γ^* decreased variably up to 30', and $(010)/(\bar{1}01)$ increased about 30'.

B. H. B.

LEJUS (A.-M.). *Étude morphologique de la cuprite de synthèse. Influence d'impuretés sur le facies.* Bull. Soc. franç. Min. Crist., 1958, **81**, 315-331, 10 figs.

Natural cuprites examined always had the forms $\{111\}$ and $\{100\}$ while $\{110\}$ was only occasionally present. Examination of synthetic cuprite has demonstrated that the form $\{110\}$ appears when the crystals are grown from a medium containing impurity ions, and that the effect of these impurities increases with their decreasing ionic radius.

R. A. H.

GOLDSZTAUB (S.) & SAUCIER (H.). *Sur la section rhombique dans la macle du péricline.* Bull. Soc. franç. Min. Crist., 1959, **82**, 99-100, 2 figs.

By considerations of crystal growth rates it is shown that for the pericline twin of triclinic feldspars the 'rhombic section' is favourable as a composition plane. J. Z.

MUKHERJEE (BIBHUTI). *An X-ray study of manganese minerals.* Min. Mag., 1959, **32**, 332-339, 1 fig.

The cell dimensions of massive, horny, botryoidal, reniform, mamillated, or stalactitic cryptomelane are a 9.82, c 2.86Å [M.M. **32**-166] whereas those of shiny pitch-like beldongrite are a 9.85, c 2.87Å. The crystal data for braunite [M.A. **4**-461] are discussed and the new space group I_4/mmm (D_{4h}^{17}) is assigned, with a 9.402, c 18.740Å, $Z=8(3Mn_2O_3 \cdot MnSiO_3)$; the indexed X-ray powder data are tabulated. Bixbyite (sitapaprite) from Sitapar, Chindwara, is assigned the new space group $Im\bar{3}$ (T_h^5) on the basis of the re-indexed powder pattern [M.A. **4**-364], with a 9.40Å, sp.gr. 5.0, $Z=16$. Jacobsite, hausmannite, and manganese-garnet are discussed: ramsdellite and γ - MnO_2 or β - MnO_2 are found associated with pyrolusite. R. A. H.

ECONOMIC MINERALS AND ORE DEPOSITS

BLAIS (ROGER A.). *A petrologic and decrepitemetric study of the gold mineralization at the O'Brien Mine, Northwestern Quebec.* Ph.D. Thesis, University of Toronto, 1954, 292 pp., 61 figs., 5 maps, 14 tables.

Auriferous quartz veins are found in early Precambrian volcanic and sedimentary rocks intruded by diorite porphyry, diorite, gabbro, granite, and albitite dykes. The veins have long vertical extension and are locally spectacularly rich in gold. Gold deposition is particularly abundant in vein rolls, vein intersections, vein deflections and graphitic shears. Decrepitation of the auriferous quartz begins between 75° and 120°C. The barren quartz decrepitates at temperatures of 130°C and higher. [M.A. **14**-30.]

G. P.

RAMDOHR (PAUL). *New observations on the ores of the Witwatersrand in South Africa and their genetic significance.* Trans. Geol. Soc. S. Africa, 1958, **61**, annexure 50 pp., 2 figs., 61 pls.

The author briefly reviews the literature on the Witwatersrand System and the two rival hypotheses ('modified placer' and 'hydrothermal') for the origin of the gold and uranium. This is followed by a profusely illustrated account of detailed examination of 140 polished sections and specimens of bankets from several reefs collected over a wide area. It is concluded that 'uranpecherz' (uranium-pitchblende, with no genetic implication) is of detrital origin but

has since been modified and partly dispersed in carbonaceous material: the apparent chemical stability of the 'uranpecherz' is ascribed to its youthful, thoroughly crystalline nature at the time of transport and deposition. A large proportion of the pyrite is considered to be of detrital origin, but the remainder is polygenetic and raises a number of interesting new problems. Gold has been recrystallized, but migrated only a very short distance. The author believes that no simple explanation of the mineralization of the conglomerates is possible in view of the evidence now available, but his views are more closely aligned with those of the 'placerists' than with those of the 'hydrothermalists'.

E. S. W. S.

CORNELISSEN (A. K.). *Note on botryoidal and stalactitic copper ores from Namaqualand.* Trans. Geol. Soc. S. Africa, 1958, **61**, 367-376, 7 figs., 5 pls.

Describes the occurrence of botryoidal and hair-like stalactitic sulphides (chalcopyrite, chalcocite, bornite) in altered zones of the mineralized diorite host-rock. The unusual form of the copper sulphides is considered to be unique and is ascribed to deposition from a colloidal state.

E. S. W. S.

TEMPLE (A. K.). *The Leadhills-Wanlockhead lead and zinc deposits.* Trans. Roy. Soc. Edinburgh, 1956, **63**, 85-113, 9 figs., 1 pl.

The primary ore minerals indicate two generations of sulphides, the second generation being attributed to reprecipitation of elements derived from the replacement of the first generation by late stage quartz. Minerals identified numbered 57, including 15 not previously recorded from the locality, one of which, phoenicochroite, has not been confirmed previously in the British Isles, and three of which are new species or varieties [M.A. 14-283]. These deposits occur in a synclinal belt of greywackes: a strike thrust fault has created a shear zone which is considered to be the controlling structural feature in the localization of the ores. They are considered to have been derived from the top of the tholeiitic crustal layer and the base of the granitic crustal layer, and were associated with the Hercynian orogeny. [M.M. 30-541; M.A. 4-468]

R. A. H.

CUP (K. C.) & WENSINK (H.). *The lead-zinc ores of Yenefrito near Panticosa (Spanish Pyrenees)*. Geol. en Mijnbouw, 1959, new ser., **21**, 434-444, 3 figs., 2 pls., 2 tables.

The lead-zinc ores of Yenefrito belong to the group of hypogene sulphide replacements and are situated near the contact-metamorphic zone on the south flank of the Panticosa granite, intrusive in Devonian shales and limestones. The ore shoots are quartz veins which contain mineralizations of sulphidic ores, mainly pyrite, blende, and galena. Chalcopyrite, jamesonite, gersdorffite, and pyrrhotine are found microscopically.

P. C. Z.

FULLER (ARTHUR O.). *Temperatures of formation of sphalerites from the Bird Reef group*. Trans. Geol. Soc. S. Africa, 1958, **61**, 97-101.

Nine specimens of blende from the Bird Reef Group of the Witwatersrand System were analysed for iron by chemical and X-ray methods. The temperatures of their formation, as inferred from data published by Kullerud and by Coleman, average about 450°C, and are higher than would be expected from depth of burial alone. It is suggested that the sphalerites crystallized during a period of hydrothermal activity associated with the earliest (Ventersdorp) phase of post-Witwatersrand volcanism.

E. S. W. S.

GHOSE (S.). *Mineralogy and textural relations of Zawar lead-zinc-silver ores*. Quart. Journ. Geol. Min. Met. Soc. India, 1958, **30**, 9-15, 14 figs.

The lead-zinc-silver ore assemblages from Zawar consist of galena, blende, pyrite, arsenopyrite, chalcopyrite, marcasite, rutile, goethite, native silver, and argentite; descriptions of the ores under the reflecting microscope are

given. The textures noted are attributed to replacement, unmixings, deformation, and recrystallization. A. P. S.

BRADBURY (J. C.). *Crevice lead-zinc deposits of Northwestern Illinois*. Rept. Invest. Illinois State Geol. Survey, 1958, **210**, 49 pp.

The crevice deposits have been found throughout the entire thickness of the Galena dolomite, but most of the mining has occurred between the base of the Dubuque member to 55 feet below the 'Drab'. The ore occurs along vertical shear joints which usually trend E.-W., although mining has been done in joints trending in other directions. The primary minerals are galena, blende, pyrite, and marcasite; the secondary minerals are cerussite, anglesite, smithsonite, and limonite. The associated clay minerals are chiefly montmorillonite with some limonite. The clay mineral in the dolomite is illite. The sequence of deposition was, in general, pyrite, marcasite, blende, galena, marcasite, and calcite, but variation, overlapping and repetition are common. Mineralization was post-Silurian, pre-Pleistocene.

W. A. WH.

BOYLE (R. W.). *Geology and geochemistry of silver-lead-zinc deposits of Keno Hill and Sourdough Hill, Yukon Territory (Preliminary report)*. Geol. Survey Canada, 1956, Paper 55-30, 78 pp.

The rocks underlying Keno and Sourdough Hills include chloritic, sericitic, and graphitic schists, quartzites, and lenses and sills of greenstones. These rocks belong to the green schist facies. A few quartz porphyry sills occur in the sediments and are the only local evidence of granitic intrusives. The ore-bearing vein faults cut all the rocks of the area. Late faults and fractures offset the vein faults. Ore shoots in the vein faults are localized in thick-bedded quartzites and greenstones and at junctions of vein faults. Schist, phyllites, and thin-bedded quartzites are structurally unfavourable to the occurrence of ore shoots. The earliest hypogene mineralization consists of quartz and carbonate epidote lenses and stringers. These bodies are cut by two types of ore shoots. The earliest contains quartz, pyrite, arsenopyrite, and some gold, and the later type contains chalybite, galena, blende, and tetrahedrite. The latter lodes are high in silver and contain only small amounts of gold. Supergene mineralization is extensive, and the chemistry and certain features of the zones of oxidation and reduction are discussed. Descriptions are given of (a) the hypogene minerals—quartz, carbonates, baryte, galena, blende, freibergite, pyrite, arsenopyrite, gold, chalcopyrite, and (b) the supergene minerals—'limonite', hydrous manganese oxides, quartz, calcite, cerussite, malachite, azurite, smithsonite, anglesite, gypsum, silver, pyrrargyrite, galena, sphalerite, hawleyite, plumbjoarosite, scorodite, and sulphur.

R. J. T.

HIWAKI (T.). *Lead and zinc deposits of Japan with special emphasis on those of the Kamioka mine*. Proc. 7th Pacific Sci. Congress (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 234-244. W. A. W.

OLEY (EDGAR H.). *Froth veins, formed by immiscible hydrothermal fluids, in mercury deposits, California*. Bull. Geol. Soc. America, 1959, **70**, 661-664, 1 pl.

Froth veins in several mercury mines in California are composed of close-packed spherical shells of quartz, chalcolitic quartz, or opal, enclosing droplets of oil; some contain spheres that are empty or partly filled with a liquid hydrocarbon. The spaces between the shells are commonly filled with the same mineral that forms the shells. These textures are explained as resulting from initial deposition of silica at interfaces separating a hydrous vein fluid and immiscible droplets of oil, followed by closed packing of the silica shells and further deposition of silica between them. Locally cinnabar was deposited as a part of the original silica shell, indicating that the immiscible fluids were ore fluids. A. L. A.

ILLÈRE (SIMONNE) & KRAUT (FRANÇOIS). *Sédimentation et métamorphisme dans le gisement de fer de Dielette (Manche)*. C. R. Acad. Sci. Paris, 1957, **245**, 2349-2351.

The Dielette deposit is of sedimentary origin by precipitation of silica, calcium carbonate, and iron oxides; the latter have been deposited directly as magnetite and hematite. The calcareous portions of the unproductive horizons and of the gangue of the ore have been metamorphosed, but the oxides and silica have not been changed. E. J. & A. S.

OMKEIEFF (S. I.). *Iron ore in the Soviet Union*. Nature, 1959, **183**, 1028.

Recently discovered deposits are described.

M. J. LE B.

UKHERJEE (SATYAMAY). *On the vanadium-bearing titaniferous magnetites of Nausahi, Keonjhar, Dt. Orissa*. Quart. Journ. Geol. Min. Met. Soc. India, 1958, **30**, 109-124, 16 figs.

Describes the texture and paragenesis of vanadiferous and titaniferous magnetites, and the associated minerals hematite, goethite, rutile, martite, chalcocopyrite and pyrite. The origin of the magnetite ore bodies is attributed to late gravitative accumulation. A. P. S.

ARCHANDISE (H.). *Le gisement et les minerais de manganèse de Kisenge (Congo belge)*. Bull. Soc. belge Géol., 1958, **67**, 187-211, 5 figs., 16 microphotos.

The deposit is described and the mineralogical characteristics of the chief minerals met at Kisenga are stated—garnet, oxides of manganese (cryptomelane, pyrolusite, lithiophorite). The mineralogical structures observed in this deposit are described. F. SCH.

BASU (NITIN KUMAR). *Manganese ore deposits of the area around Ramtek and Charbaoli, Nagpur district*. Quart. Journ. Geol. Min. Met. Soc. India, 1958, **30**, 17-31, 13 figs.

Paragenetic studies on a suite of manganese minerals (opaque and non-opaque) occurring in and around some manganese ore bodies are described. Spessartine, rhodonite, and braunite are considered the earliest minerals to form. Intergrowths of jacobsonite and hausmannite are attributed to exsolution. A. P. S.

ROY (SUPRIYA). *Mineragraphic study of the manganese ores of Tirodi, Balaghat district, Madhya Pradesh, India*. Proc. Nat. Inst. Sci. India, **24A**, 89-99, 4 pls.

Descriptions of polished sections under reflected light of assemblages carrying braunite, manganite, hollandite, jacobsonite, hausmannite, sitaparnite, pyrolusite, psilomelane, and quenselite are given. Mineral parageneses based on textural relationships and physicochemical considerations are discussed. The occurrence of quenselite and the crystallographic intergrowth between braunite and hausmannite are recorded for the first time from this area. A. P. S.

DESHPANDE (S. P.). *Ore microscopic studies of the manganese ore minerals of old M.P.—I. Dongribuzurg, Bhandara District*. Proc. Indian Acad. Sci., 1959, **49A**, 165-173, 2 figs., 1 pl.

Mineragraphic descriptions of colloform psilomelane, pyrolusite, braunite and an unidentified mineral are given; their paragenesis and the origin of pyrolusite are discussed. A. P. S.

DIETZ (ROBERT S.). *Manganese deposits on the north-east Pacific sea floor*. Calif. Journ. Mines & Geol., 1955, **51**, 209-220. K. S.

FYFE (H. E.) & REED (J. J.). *Note on the occurrence of manganese in south-eastern Wairarapa [New Zealand]*. New Zealand Journ. Geol. Geophys., 1959, **2**, 262-264, 1 fig.

Small pockets of high grade but non-economic manganese ore, mainly braunite, occur with basaltic lava and jasper intercalated within Cretaceous sedimentary rocks.

W. A. W.

CHAKRABORTY (K. L.). *Chromite ores associated with the ultrabasic rocks of Nausahi, Keonjhar district, Orissa, India—their mineragraphy and genesis.* Proc. Nat. Inst. Sci. India, 1958, **24A**, 78–88, 2 pls., 2 figs.

Chromite occurs as lenses and veins along shear planes within dunites and peridotites, indicating a structural control in their emplacement. On the evidence of field relationships, and the petrography, mineragraphy, and paragenesis of the ore minerals, these chromite ore bodies are attributed to 'residual liquid injection'. A. P. S.

CHAKRAVARTY (P. S.). *Tungsten-bearing quartz veins around Chhendapathar, Bankura dt. West Bengal, India—their mineragraphy and genesis.* Proc. Nat. Inst. Sci. India, 1958, **24A**, 358–365, 3 pls.

Description of polished sections of assemblages containing wolframite, scheelite, molybdenite, bismuthinite, magnetite, ilmenite, pyrite, arsenopyrite, pyrrhotine, and chalcopyrite, and of the textures observed are given. A. P. S.

BOWIE (S. H. U.). *The uranium and thorium resources of the Commonwealth.* Journ. Roy. Soc. Arts, 1959, **107**, 704–718, 4 figs.

Estimates are given of production and reserves of uranium and thorium in non-communist countries of the world, and show that the British Commonwealth controls about three-quarters of the resources of both metals. Some details are given of the occurrences in Canada, South Africa, Australia, India, New Zealand, and Nyasaland. The two areas richest in uranium are Blind River, Canada, and the Witwatersrand. The copper belt of Northern Rhodesia is considered to offer most hope as a future large scale supplier of uranium, while the Blind River field and the Indian placer deposits will produce the bulk of the world's thorium. The deposits being worked at Bancroft, Ontario, have the distinction of being the only granite pegmatites in the world which are worked for uranium. R. A. H.

ROSCOE (S. M.). *Geology and uranium deposits, Quirke Lake—Elliot Lake, Blind River area, Ontario.* Geol. Survey, Canada, 1957, Paper 56–57, 21 pp., 2 maps.

A preliminary report which deals mainly with stratigraphical and structural features, but includes also a short account of the ores and of the problems related to their origin. R. J. T.

ROSCOE (S. M.) & STEACY (H. R.). *On the geology and radioactive deposits of the Blind River region.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 475–483, 3 figs.

In this interim report, a summary of the geology followed by a mineralogical description of the conglomerate and associated rocks. The ore zones, mainly about 11' thick, constitute part of the extensive development of conglomeratic rocks at the base of the Huronian System. Brannerite, uraninite, and monazite are the principal minerals; they occur as individual grains in the matrix of the conglomerate together with abundant granular pyrite. Uranium and thorium values are given for numerous samples, ranging from low values for quartzites and gneisses to maxima of 1.8% U_3O_8 and 0.5% ThO_2 for conglomerate ore samples. The average values for 87 ore samples are 0.16% U_3O_8 and 0.07% ThO_2 . The authors favour a syngenetic origin for both the thorium and uranium. Arguments to the contrary are discussed. K. T.

ROBINSON (S. C.). *Mineralogy of uranium deposits, Grouse fields, Saskatchewan.* Bull. Geol. Survey, Canada, 1959, **31**, 128 pp.

This bulletin presents concise descriptions of 40 uranium deposits in this region [now known as Beaverlodge region] as a basis for discussion of their mineralogy, geochemistry, genesis, and age. All ore-bodies are epigenetic deposits. Syngenetic deposits include migmatites, monazite-bearing segregations, pegmatite, and uraniferous granite. Supragenetic deposits are of rare occurrence. The distribution, texture, environment, and paragenesis of over 80 minerals are described and illustrated by 48 photomicrographs. Pitchblende, the only major ore mineral of uranium, is associated mainly with hematite, chalcopyrite, pyrite, and galena in gangue composed of calcite, chlorite, and quartz. Other associations of interest include: thucholite, hisingerite, nolanite, gold, a suite of selenides (clausthalite, berzelianite, klockmannite, tiemannite, umangite), and a new copper-cobalt-nickel selenide, copper, and arsenides and sulphides of cobalt, nickel and iron, including arsenopyrite, cobaltite, dyscrasite, niccolite, parammelsbergite, rammsbergite, siegenite, and ullmannite. Minerals found in migmatites and pegmatite include: uraninite, fergusonite, allanite, monazite, pyrochlore, thorite, uranothorite, and xenotime. Thorium, rare earths, niobium, and tantalum accompany uranium in syngenetic deposits but are absent from the hydrothermal deposits. A complex origin is indicated by the presence of oxides, sulphides, and native metals in the same deposit, and by a paragenesis in which four generations of pitchblende and calcite and three generations of hematite and chlorite are recognized. Thirty new determinations and 8 isotopic analyses of leads from galena and clausthalites are presented. Radioactive minerals in syngenetic deposits are 1800 to 1900 m.y. old; old pitchblende is 1500 to 1700 m.y. and other generations are

recognized at 850 to 930 m.y. and 235 to 365 m.y. Other problems discussed include: relation of epigenetic to syngenetic deposits, duration and process of mineralization, nature of mineralizing solutions, temperature of deposition, vertical extent, classification and genetic association of the deposits.

R. J. T.

ROBINSON (S. C.). *A genetic classification of Canadian uranium deposits*. Canad. Min., 1958, **6**, 174-190, 2 tables.

A table lists three groups comprising 11 types; for each type one or more typical localities, the characteristic elements, the characteristic uraniferous minerals, and the characteristic other minerals are given. The classification is:

A. Igneous (magmatic): (i) granites & syenites, (ii) pegmatites, (iii) metasomatic deposits, (iv) hydrothermal deposits;

B. Sedimentary: (i) placers, (ii) conglomerates, (iii) sandstones, (iv) phosphate deposits, (v) carbonaceous deposits;

C. Supergene: (i) gossan cappings, (ii) deposits traversed by meteoric waters.

Only the following are economic in Canada: A(i) (Bancroft), A(iv) (Great Bear Lake), and B(ii) (Blind River). The mineralogy and geochemistry of the 11 types are discussed. M.A. **13-167**, 244]

R. B. F.

GRANGER (HARRY C.) & RAUP (ROBERT B.). *Uranium deposits in the Dripping Spring quartzite, Gila County, Arizona*. Bull. U.S. Geol. Survey, 1959, **1046-P**, 415-486.

Uraninite is the primary uranium mineral; secondary minerals are meta-torbernite, bassetite, uranocircite, uranophane, and β -uranophane. Sulfides are associated with nearly all the deposits.

K. S.

LOVERING (T. G.) & BERONI (E. P.). *Preliminary study of radioactive limonite in Colorado, Utah, and Wyoming*. Bull. U.S. Geol. Survey, 1959, **1046-N**, 339-384.

K. S.

COLEMAN (ROBERT G.). *Mineralogical evidence on the temperature of formation of the Colorado Plateau uranium deposits*. Econ. Geol., 1957, **52**, 1-4.

A study of sphalerite, formed in the presence of excess iron sulphide in uranium deposits in Triassic sedimentary rocks of the Colorado Plateau, in conjunction with the equilibrium diagram of the FeS-ZnS system [M.A. **12-387**] indicated a temperature of formation, corrected for pressure, in the range 55° to 115°C. Sphalerite from Happy Jack mine, San Juan County, Utah, had $a\ 5.4107 \pm 0.0003$ [units not

stated], FeS 0.11%, and sphalerite from Hidden Splendor mine, San Rafael district, Utah, had $a\ 5.4101 \pm 0.0002$, FeS 0.28%.

R. A. H.

BUSH (A. L.), BROMFIELD (C. S.), & PIERSON (C. T.). *Areal geology of the Placerville quadrangle, San Miguel County, Colorado*. Bull. U.S. Geol. Survey, 1959, **1072-E**, 299-384, 4 figs., 5 pls.

The Entrada sandstone of late Jurassic age contains tabular uraniferous vanadium deposits. Roscoelite, the major ore mineral, and montroseite are the principal vanadium-bearing minerals. Other mineral deposits include uraniferous and non-uraniferous copper-hydrocarbon-bearing veins of Cenozoic(?) age, and placer gold in terrace gravels and valley fill of Pleistocene age. K. S.

BECRAFT (GEORGE E.). *Uranium in carbonaceous rocks in the Townsend and Helena valleys, Montana*. Bull. U.S. Geol. Survey, 1958, **1046-G**, 149-164.

K. S.

KLEMIC (HARRY), HEYL (A. V., Jr.), TAYLOR (A. R.), & STONE (JEROME). *Radioactive rare-earth deposit at Scrub Oaks mine, Morris County, New Jersey*. Bull. U.S. Geol. Survey, 1959, **1082-B**, 29-59.

Rare-earth minerals, most commonly xenotime, doverite, and bastnäsite, occur chiefly in coarse-grained magnetite ore. Less abundant minerals containing rare-earth elements are zircon, sphene, chevkinite, apatite, and monazite. Bastnäsite, chevkinite, and monazite are rich in cerium; xenotime and doverite are rich in yttrium. The average content of 11 specimens of radioactive iron ore is eU 0.027, U 0.009, Th 0.062, (RE)₂O₃ 1.51, Fe₂O₃ 35.5%; there is a direct relation in abundance between equivalent uranium, uranium, thorium, and combined rare-earth oxides.

K. S.

LANDIS (E. R.). *Radioactivity and uranium content, Sharon Springs member of the Pierre shale, Kansas and Colorado*. Bull. U.S. Geol. Survey, 1959, **1046-L**, 299-319.

The Sharon Springs member and its lateral equivalents range in thickness from 155 to about 500 feet and generally contain at least 0.001 % U.

K. S.

WEIS (PAUL L.), ARMSTRONG (FRANK C.), & ROSENBLUM (SAMUEL). *Reconnaissance for radioactive minerals in Washington, Idaho, and western Montana, 1952-1956*. Bull. U.S. Geol. Survey, 1958, **1074-B**, 7-48.

The most important uranium deposits are in, or near, granitic intrusive bodies. Known thorite-bearing veins are confined to rocks of the Belt series. Radioactive minerals that have been reported from the area include

allanite, autunite, betafite, brannerite, carnotite, coffinite, davidite, euxenite, liebigite, meta-autunite, meta-torbernite, monazite, phosphuranylite, samarskite, schröckingerite, thorite, uraninite, uranophane, zippeite. K. S.

KLEMIC (HARRY), ERIC (JOHN H.), MCNITT (JAMES R.), & MCKEOWN (FRANK A.). *Uranium in Phillips mine, Camp Smith area, Putnam and Westchester Counties, New York*. Bull. U.S. Geol. Survey, 1959, **1074-E**, 165-199.

Uraninite occurs in hornblende pegmatite and in adjacent hornblende gneiss and diorite (Precambrian rocks of the Hudson highlands) in an elongate zone that is mineralized with magnetite and iron sulfides. The uraninite gives an age of approximately 920 million years by isotope ratio methods. Uraninite has sp. gr. $8.9+$, $a\ 5.46 \pm 0.02\text{\AA}$: chemical analysis by Glen Edgington and R. A. Powell gave Pb 8.50, U 59.18, Th 5.49%. K. S.

STEPHENS (JAMES G.) & BERGIN (M. J.). *Reconnaissance investigation of uranium occurrences in the Saratoga area, Carbon County, Wyoming*. Bull. U.S. Geol. Survey, 1959, **1046-M**, 321-338.

Carnotite, the only uranium mineral identified, occurs sparingly as a coating on individual cobbles and boulders and as disseminated specks in fine-grained material. No economic deposit has been found. K. S.

RUSSELL (R. T.). *Relationship of uranium ore deposits to petroleum and gas-bearing structures*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 358-366, 4 figs.

Several uranium deposits are located on productive oil and gas structures in Texas and Wyoming, where the migration of oil and gas from depth may have played an important part in the localization of the uranium ore. Uranium is also associated with asphaltite in breached structures which may once have contained oil or gas. Uraniferous asphaltite, sometimes with intergrown coffinite and uraninite, is found at Ambrosia Lake, Temple Mountain, and other places on the Colorado Plateau. The role of oil and natural gas in the transport and precipitation of uranium in both these types of deposits is discussed. K. T.

LIEBENBERG (W. R.). *The mode of occurrence and theory of origin of the uranium minerals and gold in the Witwatersrand ores*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 379-387.

This is a summary of the author's observations and conclusions since he began work on Witwatersrand ores in 1945, together with a discussion of the more recent literature.

Much information about the Dominion reef, which underlies the Witwatersrand system, is also included. The reef consists of a pyritic quartz-pebble conglomerate in which the gold and uranium are largely confined to the matrix. The principal uranium-bearing mineral is uraninite, present as small well-graded oval grains partly replaced by hydrocarbon. Secondary uraninite has formed by the recrystallization of primary grains. Alteration products include schoepite, zippeite, schröckingerite, and uranophane, which are mostly found on old stope faces. Monazite, zircon, chromite, cassiterite, garnet, and a variety of other detrital minerals occur in the matrix, together with much granular pyrite and small amounts of other sulphides and gold. The uranium-titanium mineral altered to leucoxene with 0.3-0.39% U_3O_8 is similar in appearance to altered brannerite from Blind River, Canada. Detrital grains of euxenite are common in the Dominion reef. In a lengthy discussion of the origin of the mineralization, it is concluded that the primary uraninite is a member of a sedimentary suite of heavy minerals, and that the gold could have been detrital although recrystallization has produced its present irregular shape. [M.A. **14**-395] K. T.

VAN WAMBEKE (L.). *Etude préliminaire de la zone d'altération radioactive de la pegmatite de Kobokobo (Kivu)*. Bull. Soc. belge Géol., 1957, **66**, 268-276.

Description of the minerals of the zone of alteration in the Kobokobo pegmatite, Belgian Congo, worked for beryl and columbotantalite. The minerals are limonite, barrandite?, lithiophorite, ceruleolactite, evansite, tourmaline, arctolite [M.A. **14**-52, 59]. Uranium is dispersed in the oxides as very small inclusions of a secondary mineral. The association of uranium with aluminium phosphates is noted. F. Sch.

GRITSSENKO (G. S.), BELOVA (L. N.), GETSEVA (R. V.), & SAVELYEVA (K. T.). *Mineralogical types of oxidation zones of hydrothermal uranium and sulphide-uranium ores in the U.S.S.R.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 466-474, 4 figs.

Five groups are distinguished in secondary uranium mineral associations in oxidation zones: (1) simple hydroxides, uranates, and uranosilicates, (2) uranosilicates, (3) uranosilicates and uranophosphates, (4) uranophosphate and uranoarsenates, (5) limonite and small amounts of uranophosphates and uranoarsenates. Reference is made to natural depositions of hydrogen autunite and hydroge uranium. Sodium autunite [M.A. **14**-277; A.M. **43**-383], sodium-uranospinitite [M.A. **14**-53; A.M. **43**-383], arsenic analogues of phosphuranylite and uranocircite [M.A. **14**-344; A.M. **44**-208,466], barium uranophane [M.A.

-344; A.M. 44-466], niobium-yttrium kasolite and identified uranium molybdates [A.M. 44-468] are listed as new minerals. No data are given.

J. R. H.

0.0465 (organic carbon) — 0.0076 (silicates), the uranium content of certain black shales can be calculated from the amounts of the major constituents.

K. T.

SHKIN (A. I.), TANANAYEVA (G. A.), GLADISHEV (G. D.), MELNIKOV (I. V.), POLIKARPOVA (V. A.), & TSIBULSKAYA (M. S.). *Paragenetic associations of hydrothermal uranium minerals in uranium deposits of the Soviet Union*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 445-465, 20 figs.

This is a detailed account illustrated by numerous photographs. The commonest Soviet hydrothermal uranium deposits are those in which pitchblende is associated with sulphides, particularly molybdenite. Pitchblende also often associated with calcite. Rarer uranium deposits include those in which the ore mineral is the silicate monadkevite [M.A. 13-385].

K. T.

ATAYAMA (N.). *Genesis of the uranium deposit in Tertiary sediments in the Ningyô-tôgô area, western Japan*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 402-406.

A study is made of a late Miocene or early Pliocene superne uranium deposit, which has not suffered significant alteration, with a view to the light it may throw on deposits of the Colorado Plateau or Witwatersrand types. It is included that at Ningyô-tôgô uranium extracted from weathered granite was concentrated in stagnant water and precipitated under reducing conditions. Uranium is associated with carbonaceous matter and pyrite in a porous conglomerate and is adsorbed on clay minerals in the lacustrine sediments. The uranium mineral in the sooty ore has not been determined but is considered different from uraninite or coffinite.

K. T.

MATHEWS (T. F.) & STRAHL (E. O.). *Mineralogy and chemistry of uranium-bearing black shales*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 407-411, 2 figs.

Over a thousand samples from eleven black shale formations in various parts of the United States and Europe have been investigated by autoradiographs, chemical analysis, and emission spectroscopy; nuclear magnetic resonance has been used for the determination of aromatic and aliphatic hydrogen. The main constituents of the various shales are tabulated. Uranium is loosely held in the fine-grained organic-inorganic matrix of the shale; there is no evidence of any uranium minerals except in the St. Hippolyte district, France, where the shale contains meta-autunite. A distinction is made between bituminous and carbonaceous shales. By using the regression equation $\log (U \times 10^4 + 1) = -0.801 - 0.2045 (\text{free Fe}) - 0.0400 (\text{CO}_2) + 0.0140 (\text{pyrite}) +$

NEKRASOVA (Z. A.). *The form of the occurrence of uranium in some coals*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 412-419, 11 figs.

Evidence is presented to show that the bulk of uranium in both coals and interbedded sandstones is in the form of oxides, that is pitchblende or uranium black, and that the presence of uranyl humates is questionable. In the sandstones, the uranium oxides can easily be identified mineralogically, but in coals the particle size is sometimes so small that the presence of uranium oxides can only be inferred from other evidence, including X-ray diffraction. The state of oxidation of the uranium is very variable, the measured oxygen factors ranging from 2.15 to 2.84. Two analyses are quoted of pitchblende separated from coal. The uranium content of coal (quoted in relative units only) increases with ash content and with oxygen content. The uranium is easily extracted by dilute acids.

K. T.

CANNON (R. S.), STIEFF (L. R.), & STERN (T. W.). *Radio-genic lead in nonradioactive minerals: a clue in the search for uranium and thorium*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 215-223, 3 figs.

The isotopic compositions of lead from radioactive and nonradioactive ore deposits are discussed with reference to triangular diagrams on which results are plotted on the basis $^{206}\text{Pb} + ^{207}\text{Pb} + ^{208}\text{Pb} = 100$. Anomalous leads are classified as those enriched in ^{206}Pb (U-type), in ^{208}Pb (Th-type), and in both ^{206}Pb and ^{208}Pb (J-type). The variations encountered in several mining districts are summarized and their practical significance considered.

A. G. D.

ADLER (H. H.). *Application of isotopic data to problems of uranium geology*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 224-229.

Isotopic analysis of the lead contained in pyrite and in secondary minerals from the oxidized zone of ore deposits is proposed as a geochemical prospecting technique for uranium. The origin of urano-organic matter and of sulphides and sulphates associated with uranium ores is briefly discussed, and consideration given to the use of the ratios $^{12}\text{C}/^{13}\text{C}$ and $^{32}\text{S}/^{34}\text{S}$ in understanding the genesis of carbon and sulphur in these materials.

A. G. D.

HALPERN (J.), FORWARD (F. A.), & ROSS (A. H.). *Effect of roasting on recovery of uranium and vanadium from carnotite ores by carbonate leaching*. Trans. Metall. Soc. A.I.M.E., 1958, **212**, 65-70, 3 figs., 3 tables.

It is shown that prior roasting of carnotite ores gives advantages which include improvement in settling and filtering characteristics of the ore, destruction of carbonaceous impurities, and substantial increase in extraction of vanadium. Roasting procedures and leaching procedures are discussed, and a flowsheet is given. R. G. Wls.

FORSTER (I. F.). *Paragenetical ore mineralogy of the Loolekop-Phalaborwa carbonatite complex, eastern Transvaal*. Trans. Geol. Soc. S. Africa, 1958, **61**, 359-365, 3 pls.

The paragenesis of the following ore minerals is briefly described: magnetite, chalcopyrite, valleriite, uranoan thorianite, baddeleyite, pentlandite, bravoite, bornite, millerite, linnaeite, galena, chalcocite, covellite, pyrite, ilmenite, hematite and iron hydroxides, zinc-blende, spinel, and two minerals not identified. The radioactive, cataclastic textures and micro-vein fillings and replacements indicate a well-defined paragenetical succession commencing with a pegmatitic-pneumatolytic stage (magnetite and exsolution products, baddeleyite and uranoan thorianite) followed by a hydrothermal stage characterized by sulphides. E. S. W. S.

MERTIE (JOHN B., Jr.). *Zirconium and hafnium in the southeastern Atlantic States*. Bull. U.S. Geol. Survey, 1958, **1082-A**, 1-28.

K. S.

BÉLAND (JACQUES). *St. Magloire and Rosaire-St.-Pamphile areas*. Dept. Mines, Province of Quebec, Canada, 1957, Geol. Rept. **76**, 1-49, 8 tables, 4 maps, 7 pls. Also in French: *Régions de St. Magloire et de Rosaire-St.-Pamphile*.

A regional geology study. The economic geological section comprises a description of the mine at Saint-Fabien-de-Panet (Eastern Metals). Many varied economic minerals are stated to occur at Eastern Metals: pyrite, millerite, gersdorffite, violarite, sphalerite, marcasite, pyrrhotite, arsenopyrite, chalcopyrite, bornite, chalcocite, malachite, native copper, galena. G. P.

SPRINGER (G. D.). *Geology of the Cat Lake-Maskwa Lake area, Manitoba*. Manitoba Mines Branch, 1948, Prelim. Rept., **47-2**, 9 pp., 1 map.

— *Geology of the Cat Lake-Winnipeg River area, Manitoba*. Ibid., 1949, **48-7**, 15 pp., 1 map.

— *Mineral deposits of the Cat Lake-Winnipeg River area, Manitoba*. Manitoba Mines Branch, 1950, Publ., **49-7**, 14 pp., 2 figs., 1 map.

DAVIES (J. F.). *Geology of the Oiseau (Bird) River area, Manitoba*. Ibid., 1952, **51-3**, 24 pp., 1 map.

— *Geology and mineral deposits of the Bird Lake area, Manitoba*. Ibid., 1955, **54-1**, 44 pp., 1 map.

— *Geology of the Booster Lake area, Manitoba*. Ibid., 1956, **55-1**, 15 pp., 1 fig., 1 map.

The area covered by these reports lies south-east of Lake Winnipeg. It is underlain by Precambrian rocks consisting of (a) acid and basic lava flows interbanded with quartzitic conglomerates, &c. (Rice Lake group), (b) sill-like bodies of hornblende gabbro, some with associated peridotite, intrusive into the Rice Lake rocks, and (c) granitic rocks, intrusive into (a) and (b). The most interesting mineral deposits and occurrences are:

Chromite as tiny black octahedra or grains in layered bands and disseminations up to 10 feet wide in the sill-like masses of chloritized peridotite underlying gabbro north of Bird River. The chromite zones are usually 5-10 feet thick, occasionally 50 feet wide, and they extend with interruptions for a length of about 12 miles. The Bird River deposit is part of the south limb of an anticline, and small chromite deposits occur in the area of the other limb about 10 miles north at Maskwa and Euclid lakes. The low chromium-iron ratio, 1.2 to 1.6, has prevented the commercial use of this deposit. [M.A. 9-66, 244]

Sulphides occur in various parts of the area at or near contacts between the granite and the older peridotite, andesite, &c. The most important copper deposits consist of pyrrhotite, chalcopyrite, cubanite, pyrite, and magnetite and occur north of Bird River and west of Cat Lake. The most important copper-nickel deposits consist of pyrrhotite, pentlandite, chalcopyrite, cubanite, pyrite, and magnetite, with occasional violarite on the weathered surface, and occur north of Bird River and north of Maskwa Lake.

Pegmatites. (i) Lithium minerals occur in abundance, the main localities being north and west of Cat Lake, east and north of Bernic Lake, and south of the Winnipeg River. The principal lithium mineral in all these localities is white to green spodumene in rough crystals and masses up to 1 foot long. Lepidolite on which age determinations have been made (see under 'uraninite' below) is abundant in the dikes south of the Winnipeg River, and amblygonite in those east of Bernic Lake. Other lithium minerals occurring in smaller amounts east of Bernic Lake are triphylite, purpurite, and petalite. The principal non-lithium minerals in all the dikes are coarse quartz, albite, microcline, and mica (muscovite or biotite) with, at different localities, lesser tourmaline, beryl, apatite, garnet, cassiterite, tantalite-columbite, uraninite, monazite, and topaz [M.A. 3-44, 4-414, 5-42, 439, 442, 7-21]. (ii) Beryl occurs with the lithium minerals as white, yellow or green masses or as good hexagonal prisms up to one foot long mainly near Cat Lake, Bernic, Shatford, and Greer lakes, and south of the Winnipeg

er on the Huron claim [M.A. 3-445, 5-42]. (iii) Cassi-
e as small black grains is distributed erratically in
e of the pegmatites near Shatford, Bernic, and Rush
s. (iv) Uraninite occurs with beryl and tantalite as
ll cubes in a pegmatite south of the Winnipeg River
he Huron claim, well-known because age determinations
e on the uraninite, on the accompanying monazite,
on lepidolite from nearby have shown these deposits
be very ancient, up to 2400 m.y. [M.A. 5-132, 7-498,
372, 547, 11-226]. (v) Rose quartz, some of gem
lity, occurs in a small dike north of Birse Lake [M.A.
03].

R. B. F.

CH (W. L.). *Mineral production in Illinois in 1958*.
Circ. Illinois State Geol. Survey, 1959, **279**, 43 pp.

The value and production statistics of minerals produced
Illinois for 1958 are given.

W. A. Wh.

BRISON (J. E.) & WELLS (J. D.). *Geology and ore deposits
of the Chicago Creek area, Clear Creek County, Colorado*.
Prof. Paper U.S. Geol. Survey, 1959, **319**, 1-92, 48
figs., 13 pls., 15 tables.

The proportion of the metallic minerals in any vein is
d as the basis for classifying the veins into types:
itic, pyritic with copper sulfides, pyritic galena-blende
h copper sulfides and copper and silver sulfosalts,
ena-blende with pyrite and marcasite and copper and
er sulfosalts, and galena-blende. The veins are meso-
rmal fillings of fault fissures. The most common
mary metallic minerals in the veins are pyrite, chalc-
rite, blende, tetrahedrite-tennantite, polybasite, galena,
rcasite, and free gold or electrum. The most common
ondary minerals are covellite, azurite, malachite, and
ulcanthite; 'limonite' and hematite; cerussite and
lfenite; and torbernite, autunite, and sooty pitchblende.
ne silver-bearing veins contain argentite and polybasite
ich may be supergene.

K. S.

THCART (JAMES B.) & MCGREEVY (LAWRENCE J.).
*Results of geologic exploration by core drilling, 1953,
land-pebble phosphate district, Florida*. Bull. U.S. Geol.
Survey, 1959, **1046-K**, 221-298, 19 pls.

The most commonly encountered minerals are quartz,
cite, apatite, kaolinite, montmorillonite, attapulgite,
omite, wavellite, and crandallite.

K. S.

AR (DAVID). *Notes on four minor sulphide prospects near
Coromandel [New Zealand]*. New Zealand Journ. Geol.
Geophys., 1958, **1**, 514-518, 1 fig.

Descriptions are given of four small, non-economic
deposits. Pyrite is the main mineral present.

W. A. W.

TAN (L. P.). *The sulfur-melnikovite deposits of the Szechuang-
tzeiping area, Taipeih sien, Taiwan*. Proc. Geol. Soc.
China [Formosa], 1959, no. 2 (for 1958), 123-145,
11 figs., 4 pls.

Sooty black cryptocrystalline pyrite and marcasite, and
sulphur, occur in a gangue of quartz, opal, and clay minerals
on the slope of a Pleistocene volcano: the country rocks
are mainly andesite flows with interbedded agglomerate
lenses. The shallow-seated occurrence, the abundance of
opal, and the representative textures of crustification,
brecciation, and vugs indicate that the deposits are
epithermal in origin; the presence of diffusion banding,
and of reniform and botryoidal textures suggests a colloidal
hydrothermal solution. The term melnikovite [M.A. 8-183,
9-281] is used for the sooty black unstable variety of pyrite
or marcasite which is of colloidal origin; it may represent
a transitional phase between colloidal iron sulphide and
well-crystallized pyrite or marcasite (though the two
specimens X-rayed were shown to be pyrite). Chemical
analyses are given for the fresh andesite, for five specimens
of hydrothermally altered andesite, and for halloysite
(n 1.528, sp.gr. 2.2), römmerite (α 1.521, β 1.565, γ 1.583),
halotrichite (α 1.475, β 1.480, γ 1.483), and melanterite
(α 1.468, β 1.476, γ 1.485).

R. A. H.

CHAKRAVARTY (P. S.). *Mineragraphic studies of some
sulphide mineral veins near the Trifunction of Bankura,
Midnapore and Purulia districts, West Bengal*. Proc.
Nat. Inst. Sci. India, 1958, **24A**, 264-268, 2 pls.

Mineragraphic studies under reflected light of assemblages
of galena, sphalerite, arsenopyrite, pyrite, and pyrrhotine,
argentiferous galena, and proustite. Replacement relation-
ships of the minerals are discussed.

A. P. S.

SUZUKI (JUN.). *Ultra-basic rocks and associated mineral
resources in Hokkaido, Japan*. Proc. 7th Pacific Sci.
Congress (Auckland and Christchurch meeting), 1953
(for 1949), **2**, 244-248.

W. A. W.

[LEVONIK (B. S.)] Левоник (Б. С.). Количественное
определение минералов в рудных скоплениях способом
детерминантов. [Quantitative determination of minerals
in ores by means of determinants.] Зап. Всесоюз. Мин.
Общ. [Mem. All-Union Min. Soc.] 1959, **88** (1), 89-93.
S. I. T.

EXPERIMENTAL MINERALOGY

DICKSON (FRANK W.) & TUNELL (GEORGE). *The stability relations of cinnabar and metacinnabar*. Amer. Min., 1959, **44**, 471-487, 9 figs.

This study indicates that red HgS, cinnabar, inverts to black HgS, metacinnabar, at 344°C and one atm. pressure. The inversion is rapid and reversible for pure HgS. Small amounts of Fe, Zn, or Se in the metacinnabar retard inversion. Iron and zinc in the metacinnabar depress the inversion temperature to 305°C and 240°C, respectively. Studies of ores and protores containing both species show in general that metacinnabar was deposited earlier and that metacinnabar is not an alteration product of cinnabar. Some cinnabar could be an inversion product of metacinnabar. Petrological evidence shows that metacinnabar occurs as a hypogene mineral. [M.A. 14-336] A. C. H.

RINGWOOD (A. E.). *The olivine-spinel inversion in fayalite*. Amer. Min., 1959, **44**, 659-661.

The transition point for the conversion of fayalite to spinel at 600°C is approx. 38,000 bars. A sample of moistened Rockport fayalite was almost completely converted to spinel when held for 1 hour at 600°C and 70,000 bars. A. C. H.

TRÖMEL (G.) & KRIESEMENT (O.). [*The α - β cristobalite inversion*. Tonindustr. Zeit., 1959, **83**, 118, 2 tables, 5 figs.] Brit. Ceram. Abstr., 1959, abstr. 1788.

Microcalorimetric investigations on pure well-crystallized cristobalite powders showed that the inversion extends over a temperature range of at least 10°C and that the hysteresis amounts to 27°-36°C. Both the mean inversion temperature and hysteresis increase somewhat with increasing calcination temperature. The inversion was found to be purely a function of temperature which could be expressed quantitatively by a Gaussian error integral. Since α -cristobalite is birefringent, its inversion could be observed under a high temperature polarizing microscope and filmed. Each crystal has rigid fixed conversion temperatures T'_o and T'_u . Observation of the inversion temperatures of numerous individual crystals confirmed the results of the microcalorimetric measurements. Calculation showed that no correlation existed between T'_o and T'_u . The crystals inverted in less than $\frac{1}{8}$ th sec. A. G. C.

HILL (V. G.) & ROY (R.). *Silica structure studies. VI. On tridymites*. Trans. Brit. Ceram. Soc., 1958, **57**, 496, 4 figs., 1 table.

'Tridymite' has been prepared from a variety of very pure starting materials, including transistor-grade silicon, in a sealed platinum system using only pure H₂O or D₂O as

a flux. Two forms of tridymite, herein named tridymite (for metastable) and tridymite-S (for stable) have been prepared under different heat treatment conditions. These two forms are related to each other by a very sluggish reconstructive monotropic transformation; the M-phase may be transformed to the S-phase by prolonged treatment. Each form has its characteristic X-ray powder diffraction pattern. The d.t.a. patterns of the two forms also differ. The data on tridymite synthesis add evidence in favour of the existence of tridymite as a stable phase in the pure SiO₂ system, and to an understanding of the variabilities in the properties of tridymite. A. G. C.

TOROPOV (N. A.) & GALAKHOV (F. YA.). [*Solid solution in the system Al₂O₃-SiO₂*. Izvest. Akad. Nauk. S.S.S.R., 1958, no. 1, 8, 3 figs., 1 table]. Brit. Ceram. Abstr., 1959, abstr. 1505.

The region of the phase diagram between 62% and 80% Al₂O₃ was studied. From the results it was deduced that there is a solid solution between mullite (3Al₂O₃.2SiO₂) and a eutectic consisting of 79% Al₂O₃ and 21% SiO₂; the region of solid solution ends at 78% Al₂O₃. No solid solution was found on the SiO₂ side of the mullite composition, but a final decision is reserved until further research has been done. A. G. C.

HAMILTON (D. L.) & MACKENZIE (W. S.). *Nepheline solid solution in the system NaAlSi₃O₈-KAlSi₃O₈*. Journ. Petr., 1960, **1**, 56-72, 6 figs.

The boundary has been determined, experimentally, which delimits the field of nepheline solid solution in the system. All experiments were carried out in Tuttle 'copper seal' pressure vessels at 700°C and a water pressure of 15,000 lb/in². The boundary curve can be represented approximately by a straight line joining Ne₉₀Ks₁₀Qz and Ne₆₄Ks_{35.5}Qz_{0.5}. Determinative curves are presented for nephelines lying close to this line (with maximum excess silica and in equilibrium with feldspar at 700°C), relating chemical composition to values of $2\theta(\text{CuK})_\alpha$ for the 2130 and 2022 reflections. The change in slope of these curves at a point represented by the formula Na_{5.97}K_{1.64}□_{0.39}Al_{7.61}Si_{8.39}O₃₂ is observed, and the likelihood that this represents an ordered compound at low temperatures is discussed. G. M. B.

Note: Journal of Petrology, a new journal intended as a vehicle for the publication of original researches in the whole range of subjects which fall within a liberal definition of petrology. The first number of Vol. 1 was published in March 1960, London (Oxford University Press).

COO (A.). *Untersuchungen über das 4-Stoff-System MgO—FeO—Fe₂O₃—Al₂O₃. Recherche sul sistema quaternario MgO—FeO—Fe₂O₃—Al₂O₃*. Radex Rundschau, 1958, no. 6, 282, 1 table, 7 figs. [In German and Italian with German, Italian, French, and English summaries.]

Equilibrium conditions at 1600°C in air were investigated the X-ray and optical examination of 10 mixes with composition ranges from 20.16–90.6% MgO, 3.4–79.84% Fe_2O_3 and 0–26% Al_2O_3 . Two of these mixes were also heated to 1650°C. The existence of a quaternary solid solution in MgO was confirmed, the probable limits of which are shown diagrammatically. This solid solution explains certain zonal structures noted by several authors in laboratories. A. G. C.

ADACHOVSKI (F.) & GRYLICKI (M.). [Phase equilibria in the system $2\text{BaO} \cdot \text{SiO}_2$ — $2\text{CaO} \cdot \text{SiO}_2$ — $2\text{MgO} \cdot \text{SiO}_2$. Silicatechnik, 1959, 10, 77, 3 figs., 6 tables.] Brit. Ceram. Abstr., 1959, abstr. 1979.

Sintered products made from MgO, BaO, CaO, and Fe_2O_3 were investigated by X-ray and microscopical methods. Four new compounds were prepared— $\text{BaO} \cdot 3\text{MgO} \cdot 2\text{SiO}_2$, $\text{BaO} \cdot \text{MgO} \cdot \text{SiO}_2$, $\text{BaO} \cdot 2\text{CaO} \cdot \text{MgO} \cdot \text{SiO}_2$, and $5\text{BaO} \cdot 3\text{CaO} \cdot 4\text{SiO}_2$. A. G. C.

ELLER (S.) & MILLER (C. E.). *Substitution of Fe³⁺ for Al³⁺ in synthetic spessartite*. Amer. Min., 1959, 44, 665–667.

Experimental data at atmospheric pressure show that a maximum of about 20% of the Al^{3+} was replaced by Fe^{3+} . A. C. H.

MARKER (R. IAN). *The synthesis and stability of tilleyite, Ca₂Si₂O₇(CO₃)₂*. Amer. Journ. Sci., 1959, 257, 656–667, 3 figs.

At 5000 lb/in² of CO₂ tilleyite is stable between 930° and 1000°C, and at 3000 lb/in² of CO₂, between 870° and 930°C. Experiments showed that traces of alumina and fluorine are necessary to promote the formation of tilleyite, and natural mineral assemblages tend to confirm this conclusion. On a $P(\text{CO}_2)/T$ diagram tilleyite is stable only in a narrow band between the fields of spurrite and calcite + wollastonite. X-ray powder data on a natural and two synthetic tilleyites are all very similar. H. W.

ULBICKI (GEORGES). *High temperature phases in sepiolite, attapulgite and saponite*. Amer. Min., 1959, 44, 752–764, 9 figs., 1 table.

Enstatite was formed above 800°C during heating of selected samples of sepiolite, attapulgite, and saponite. Quartz was formed at 1000 to 1100°C in attapulgite, and

β -cristobalite in all three clay minerals above 1200°C. Development of these phases was followed using continuous X-ray diffraction. Four d.t.a. curves to 1400°C are also given. The best crystals of enstatite are formed most rapidly from well crystallized sepiolite. Cations other than Mg and Al apparently have little effect on these changes. Structural similarities of enstatite, attapulgite, and sepiolite are compared. B. H. B.

TAYLOR (H. F. W.). *The transformation of tobermorite into xonotlite*. Min. Mag., 1959, 32, 110–116, 3 figs.

A crystal of tobermorite [M.M. 30–293] gave on treatment with water at 380°C and 250 atmospheres, a preferred orientation aggregate of xonotlite together with what is probably unorientated silica. The orientation relationship of the product and the starting material was established; the change occurs without intermediate dehydration of the tobermorite to the 9.35Å state. The structural basis of the relationship is discussed, and it is compared with those already reported for the transformations of tobermorite into wollastonite and of xonotlite into wollastonite [M.A. 14–21]. A simple experimental procedure for the single-crystal study of hydrothermal reactions is described.

R. A. H.

KLINGSBERG (CYRUS) & ROY (RUSTUM). *Stability and interconvertibility of phases in the system Mn—O—OH*. Amer. Min., 1959, 44, 819–838, 3 figs., 8 tables.

The system Mn—O—OH has been studied and numerous equilibrium and non-equilibrium reactions were determined. Special problems of technique and interpretation encountered in adding oxygen gas to water vapour in this work are reviewed. Well crystallized pyrochroite and manganite were reproducibly synthesized. The univariant P – T curves for $\text{Mn}(\text{OH})_2 \rightleftharpoons \text{MnO} + \text{H}_2\text{O}$ and $2\text{MnOOH} = \text{Mn}_2\text{O}_3 + \text{H}_2\text{O}$ were determined; at 15,000 lb/in² the curves pass through 392°C and 272°C respectively and both are very steep from 3000 to 25,000 lb/in² water pressure. Groutite and ramsdellite are interconvertible by low temperature oxidation or reduction. Hydrohausmannite is unstable above 100°C. X-ray powder data are given for synthetic pyrochroite, hausmannite, and an intermediate compound, 'groutellite', in the ramsdellite → groutite reaction. Crystal chemical generalizations and trends in this and other oxide–hydroxide systems are reviewed.

B. H. B.

BUDNIKOV (P. P.) & ZAGREBNEVA (A. V.). [Investigation of the properties of gypsum at high temperatures. Ukrainsk. Khim. Zh., 1958, 24, 528, 3 figs., 3 tables.] Brit. Ceram. Abstr., 1959, abstr. 1268.

The effect of heating gypsum at various temperatures up to 1300°C was studied. A. G. C.

DROSTE (J. B.) & GRIM (R. E.). *A continuous X-ray investigation using an autoclave of the conversion of gypsum to hemihydrate*. Amer. Min., 1959, **44**, 731-737, 6 figs.

An autoclave fitting on to a General Electric X-ray diffractometer is described. Continuous X-ray studies can be conducted at steam pressures up to 25 lb/in² and 130°C. The conversion of gypsum to hemihydrate has been examined; it is complete when the steam pressure is raised from 14 to 20 lb/in² in 20 minutes, and is faster at increased pressure. There appears to be no intermediate step in the gypsum to hemihydrate transition. B. H. B.

WYLLIE (P. J.) & TUTTLE (O. F.). *The system CaO—CO₂—H₂O and the origin of carbonatites*. Journ. Petr., 1960, **1**, 1-46, 17 figs.

The effect of water on melting relations in the system CaO—CO₂ is discussed, with full details of experimental method and results. The authors are concerned with the physical and chemical nature of carbonatite during emplacement. Phase relations in the ternary isobaric (TX) prism were determined at 1000 bars pressure between 600°C and 1320°C, and show that (a) calcite melts incongruently at 1310°C, (b) portlandite melts congruently at 834°C, (c) a binary eutectic exists between calcite and portlandite at 685°C, and (d) melting begins at 740°C on the join calcite-water. In addition, the minimum liquidus temperature within this prism is 675°C, at a composition 65CaO, 19CO₂, 16H₂O (wt. %). PT curves for univariant equilibria have been established in the pressure range 27 to 4,000 bars; within this interval the minimum liquidus temperature varies between 685°C and 640°C. Liquids in the system are regarded as simplified carbonatite magmas, and exist at moderate temperatures, with a low viscosity, through a wide pressure range. The evidence supports a magmatic origin for intrusive carbonatites, rather than one by gas transfer. The partial melting of limestones at igneous contacts is discussed. [M.A. 14-334] G. M. B.

PROTAS (J.). *Contribution à l'étude des oxydes d'uranium hydratés*. Bull. Soc. franç. Min. Crist., 1959, **82**, 239-272, 23 figs.

Hydrated oxides of uranium have been precipitated by reaction between aqueous solutions of uranyl salts and salts of Ca, Sr, Ba, Pb, and Bi at various temperatures between 100° and 180°C. Schoepite U₄O₉(OH)₆.5H₂O, becquerelite CaU₆O₁₆(OH)₆.8H₂O, billietite BaU₆O₁₆(OH)₆.8H₂O, curite 3PbO.8UO₃.5H₂O, fourmarierite PbO.4UO₃.5H₂O, vanderiesscheite PbO.7UO₃.12 H₂O, and uranosphaerite UO₄Bi(OH)₄, and other compounds not known to occur in nature have been synthesized, and their specific gravities, optical properties, chemical compositions, d.t.a. curves, and thermo-

gravimetric curves are recorded. Natural occurrences of these minerals are also discussed, and properties and occurrences of richetite, masuyite, wölsendorfite, and a new unnamed mineral [M.A. 14-414] are recorded. R. A. H.

MACKENZIE (ROBERT C.) & MELDAU (ROBERT). *The ageing of sesquioxide gels. I. Iron oxide gels*. Min. Mag., 1959, **32**, 153-165, 5 figs.

The gels prepared by adding ammonium hydroxide rapidly to ferric chloride solutions to various pH values are shown to consist of amorphous material and crystalline goethite. The goethite grows as acicular crystals on ageing at all pH values, but the rate of growth is greater at higher pH. The exothermic d.t.a. peaks of such gels appear to be due to coalescence of extremely minute hematite particles to give larger particles, the sharpness of the peak indicating to some extent the size of the original hematite particles. The morphology of hydrated iron oxides under the electron microscope is considered.

R. A. H.

DACHILLE (F.) & DENT (L. S.). *High pressure forms of BPO₄ and BaSO₄; quartz analogues*. Acta Cryst., 1959, **12**, 820.

J. Z.

SU (LIANG-HO). *A mineralogical study of the corrosion of checker bricks from open-hearth steel furnaces*. Trans. Brit. Ceram. Soc., 1950, **49**, 420-453, 15 figs.

The phases present in the corrosion products of checker bricks include mullite, plagioclase (labradorite to bytownite), melilite (ϵ 1.642, ω 1.660), acmite, hematite, and transparent brownish spinel with sp.gr. 3.628, $n \approx 1.87$, a 8.209Å. The corrosion products of silica and semi-siliceous bricks are tridymite (α 1.469, γ 1.473), wollastonite, deep brown spinel, pyroxene, andradite, and anhydrite. The andradite garnet occurs as yellow trapezohedra with n 1.87, sp.gr. 3.939, a 12.065Å: partial chemical analysis gave MnO 0.74, Cr₂O₃ 1.40.

R. A. H.

TILLER (W. A.). *The use of controlled solidification and equilibrium-diagram studies*. Trans. Metall. Soc. A.I.M.E., 1959, **215**, 555-559, 8 figs.

It is shown, from theoretical consideration, that the use of controlled solidification in phase-diagram studies enables the determination of liquidus and solidus surfaces, as well as tie lines for a polycomponent system. Two methods are described for obtaining this information. R. G. Wls.

YUE (A. S.). *Determination of maximum terminal solubility*. Trans. Metall. Soc. A.I.M.E., 1959, **215**, 870-871.

A method is described for determining the maximum terminal solid solubility in binary eutectic systems.

R. G. Wls.

OLDÁN (J.) & PALEČEK (M.). *Vliv teploty, koncentrace a doby působení činidla na chemickou odolnost tavených hornin*. [Influence of the temperature, concentration and duration of the reagent on the chemical resistance of molten rocks.] *Silikáty*, 1957, **1**, 297–312, 12 figs., 12 tables.

Tests of chemical resistance in different media (H_2O , $NaOH+Na_2CO_3$, HCl , H_3PO_4 , HNO_3 , $CrO_3+H_2SO_4$) have shown that chemical corrosion rapidly increases with rising temperature, the experimental curves and the

deduced equations showing exponential relationship. The quantity of dissolved matter at boiling temperature increases with increasing concentration of HCl or of $NaOH+Na_2CO_3$. Long-term experiments at room temperature have shown the highest solubility at concentrations of 5 to 15% HCl ; with higher concentrations solubility decreases. The less basic and the fairly basic basalts show nearly linear solubility–time relationship during 24 hours' test in solutions of strong acids or alkalies. Distinct differences have been observed between the statically and dynamically cast samples. The experiments were carried out on products made of nepheline basanite from Libochovany, western Bohemia, and of basalt from Nová Baňa, southern Slovakia, which are processed in industry. J. K.

GEMSTONES

FEIS (ESMERALDINO). *Os grandes diamantes Brasileiros*. Divn. Geol. Min., Dept. Nat. Prod. Mineral., 1959, Bol. **191**, 65 pp., 40 figs., 1 map.

A general review of the big diamonds of Brazil. Some examples from other localities are cited and comparative data on morphology given.

A. B. R.

MONSDALE (K.), MILLEDGE [née Grenville-Wells] (H. J.), & NAVE (E.). *X-ray studies of synthetic diamonds*. *Min. Mag.*, 1959, **32**, 185–201, 4 figs., 2 pls.

Synthetic diamonds made by the General Electric Co. of New York and by Allmänna Svenska Elektriska Aktiebolaget, Västerås, Sweden, have been investigated. The G.E. diamonds always contain single crystal inclusions of nickel or of a Ni-rich face-centred cubic compound, these inclusions being strictly parallel to the diamond surrounding them, and both are usually twinned on (111). It is suggested that epitaxial growth is part of the mechanism of the graphite \rightarrow diamond transformation in the G.E. technique. The Swedish synthetic diamonds do not contain nickel but are generally less well crystallized than the G.E. specimens. Both products give good diffraction spots indicating a well-ordered structure with very rarely any graphite present. The Hannay diamonds [M.M. **26**–315] may be natural and not synthetic. [M.M. **29**–803]

R. A. H.

ORLOV (YU. L.) Орлов (Ю. Л.). К вопросу о генезисе округлых форм кристаллов алмаза [A contribution to the problem of the genesis of rounded forms of diamond crystals.] Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **9**, 86–98, 17 figs.

Traditionally there are two theories in explanation of the origin of rounded forms in diamond crystals. V. M.

Goldschmidt and A. E. Fersman suggested that solution is responsible; Van der Veen claims that layered growth is the principal conditioning factor. Textural and structural evidence is advanced in support of the former theory.

N. R.

LEINZ (VICTOR) & LEONARDOS (O. H.). *Notas sobre as esmeraldas da Fazenda das Lages, Itaberai, Goiás*. *Gemologia*, 1959, **16**, 7–14.

Spectrochemical analysis showed Si, Al, Be, and traces of Cr, Ni, V, Ti, and Mg. Pleochroism α emerald green faintly bluish, γ emerald green faintly yellowish. Inclusions are dolomite alone; dolomite with talc and rutile; talc and rutile; talc, rutile, and biotite. Source rock seems to be talc schist.

A. B. R.

FEOFILOV (P. P.) & KUZNETSOV (L. A.). [Spectrographic luminescence determination of chromium in synthetic rubies. *Inzh. Fiz. Zhur.*, 1958, **1**, 46–52.] *Anal. Abstr.*, 1959, **6**, abstr. 2122.

In the luminescence spectrum of synthetic ruby an increase in the concentration of Cr causes an increase in the intensity of the infrared region of the spectrum. Cr can be determined with an error of 5%.

R. A. H.

SAURIN (E.). *Some gem occurrences in Cambodia*. *Rocks and Minerals*, 1957, **32**, 397–398, 1 fig.

Occurrences of ruby, sapphire, zircon, amethyst, and rock crystal are described. A map showing the locations of ten important gem districts is included.

R. S. M.

ZWAAN (P. C.). *The gem collection of the Rijksmuseum van Geologie en Mineralogie of Leiden. The peridots*. *Leidse Geol. Mededelingen*, 1959, **22**, 501–516, 5 figs.

A, partly very old, collection of peridots of gem quality from several known localities, is described. Investigation by optical methods showed that all these peridots have more or less the same chemical composition, which implies that it is not possible to determine their source from physical data. Diagnostic inclusions are only found in peridots from Egypt and Siberia.

C. J. O.

TRUMPER (L. C.). *Zincite—a rare gemstone*. *Gemmologist*, 1959, **28**, 81–83.

A faceted zincite, weighing 1.528 carats, had sp.gr. 5.665. Refractive indices were estimated at 2.00 to 2.10 by means of a differential reflectometer devised by the author. Absorption spectra were strong at 5150Å and between 5900 to 6300Å. Inclusions were hair-like and in small clouds. Franklin Furnace, New Jersey, U.S.A., is the only source of gem zincite.

G. F. A.

RUFF (E.). *Jade story—American (2)*. *Journ. Gemmology*, 1959, **7**, 141–160.

A further historical account [M.A. 14–265] of Mexican jade, with quotations from various texts on the subject. [M.A. 14–40]

R. A. H.

WEBSTER (R.). *The jades*. *Gemmologist*, 1959, **28**, 157, 166–168, 5 figs.

Minerals which have been used to simulate jade are bowenite, prehnite, massive grossular garnet, massicotite, idocrase, microcline feldspar, smithsonite, chrysoprase, green aventurine quartz, saussurite, smaragdite, pseudomorphite, verdite, and agalmatolite. A green material from New Guinea, astridite, is composed of chrome-rich jadeite intergrown with picotite, quartz, opal, and limonite. Jade is stained to an Imperial jade colour and to a rich mauve.

G. F. A.

GOSSE (RALPH C.). *The gem varieties of opal*. *Rocks and Minerals*, 1959, **34**, 487–490.

Descriptions, and general localities, are given for about 25 varieties of opal.

R. S. M.

FRANCO (RUI RIBEIRO). *Âmbar e suas imitações*. *Gemmologia*, 1958, **13**, 11–14.

Notes on amber and similar materials, with sp.gr. and refr. ind. values.

A. B. R.

GEOCHEMISTRY

HAWKES (H. E.). *Principles of geochemical prospecting*. Bull. U.S. Geol. Survey, 1957, **1000-F**, 225–355. Price 40 cents.

Reviewed M.M. 32–253 by A. F. HALLIMOND.

GREEN (JACK). *Geochemical table of the elements for 1959*. Bull. Geol. Soc. America, 1959, **70**, 1127–1184, 1 fig.

This is a revision of a similar paper by the same author [M.A. 12–285]. Information of use to the geochemist is tabulated in a conventional periodic table. Items included are: geochemical character, various data on weight, structure, size, and charge, thermodynamic properties, isotopic abundances and half-lives, and elemental abundances in various geochemical spheres. Elemental gradients of chemical, electrical, and thermodynamic parameters, which may be of geochemical interest, are also tabulated. The text summarizes briefly the post-1953 geochemical literature; it includes a tabular résumé of the chemical analyses of the Russian Platform sediments, an element by element list of sources of abundance data, and an extensive, predominantly post-1953, bibliography.

A. L. A.

ROSHOLT (JOHN N., Jr.). *Natural radioactive disequilibrium of the uranium series*. Bull. U.S. Geol. Survey, 1959, **1084-A**, 1–30.

Many radioactive samples show radioactive disequilibrium [that is, daughter products decay at a rate different from the rate at which they are produced from the parent isotope] because of the numerous geochemical processes affecting ore deposits. As it is difficult to interpret disequilibrium by simply comparing radiometric and chemical assay values of uranium, analyses should be made of the abundance of ²³¹Pa, ²³⁰Th, ²²⁶Ra, ²²²Rn, and ²¹⁰Pb. Uranium-series disequilibria, as shown by radiochemical studies of samples representing a cross section of most of the significant present-day radioactive deposits in the United States, can be classified according to six basic types. Interpretation of the geochemical history of these types indicate that it may be possible to date uranium deposition within a theoretical range of 2,000 to 200,000 years. Ages ranging between 6,000 and 30,000 years have been calculated for several specific examples. [Author's abstract]

K. S.

JEDWAB (J.). *Une solution stable du dithiol pour la prospection géochimique du tungstène*. Bull. Soc. belge Géol., 1958, **67**, 104–109.

A study of the stability of an acetone solution of dithiol and of the application of the solution to analysis of soils containing tungsten. The results showed satisfactory agreement with those obtained previously on the same soils by other methods. [M.A. 13–256]

F. Sch.

LANIER (C.). *Dispersion secondaire du tungstène et de l'arsenic en sol résiduel*. Bull. Soc. franç. Min. Crist., 1958, **81**, 194–200, 6 figs.

The results of geochemical prospecting on a mineralized vein with wolframite, scheelite, and arsenopyrite at Bertrande-Limousin, Haute-Vienne, show that it is possible in certain cases to prospect geochemically for tungsten by analysing soils for arsenic.

R. A. H.

HEOBALD (P. K., Jr.) & THOMPSON (C. E.). *Geochemical prospecting with heavy-mineral concentrates used to locate a tungsten deposit*. Circ. U.S. Geol. Survey, 1959, **411**, 13 pp.

A new prospecting technique, in which heavy-mineral concentrates panned from alluvial gravels are analyzed by rapid methods, has been used to trace a tungsten anomaly over a distance of 45 miles from the eastern limit of the Front Range, Colorado, to Red Mountain, near the Continental Divide. Discovery of a previously unknown deposit of hübnerite was made.

K. S.

EDWAB (J.). *Prospection géochimique de kimberlite diamantifère au Congo belge*. Bull. Soc. belge Géol., 1958, **67**, 404–418, 4 figs.

A review of the main geochemical characters of nickel is followed by a study of several profiles obtained in the Bushimaie region, Belgian Congo, in the vicinity of known kimberlitic rocks. The author concludes that there are abnormal quantities of nickel in the soils overlying such rocks and draws attention to the possibilities of geo-

chemical prospecting in the search for concealed kimberlite bodies.

F. Sch.

LOVERING (T. S.). *Significance of accumulator plants in rock weathering*. Bull. Geol. Soc. America, 1959, **70**, 781–800, 1 fig.

Accumulator plants differ widely in the elements accumulated; they have been studied chiefly because of their capacity to pick up minor elements deleterious to agriculture. However, some plants are able to accumulate certain major elements, such as silicon, aluminium, calcium, manganese, and iron, in such quantity as to have geological implications. Many kinds of vegetation, especially in the tropics, contain several per cent silica dry weight. A forest of such vegetation averaging 2.5% SiO₂ and 16 tons dry weight of new growth per year would extract about 2000 tons SiO₂ per acre in 5000 years—equivalent to the silica in 1 acre-foot of basalt. Such a process could convert basalt into lateritic soil rapidly, in the geological sense. The amount of silica in ground water in such rock seems inadequate to provide the silica required by the plants; biochemical factors must therefore cause more rapid solution of silica. Much organically derived silica may be recycled or added to ground water, nevertheless, under tropical conditions, large amounts of siliceous organic debris must be swept into the drainage system. If removal does not equal the rate of accumulation the upper soil horizons may become enriched in silica. Plants which accumulate other elements may be of geological importance in developing other special soil types and in expediting the selective removal of certain elements.

A. L. A.

METEORITES AND TEKTITES

SHULZHENKO (A. I.) Шульженко (А. И.). Находка метеорита [*Finding of a meteorite*]. Природа [Priroda], 1959, No. 5, 115, 2 figs.

What may prove to be a fossil meteorite was discovered in excavating an adit from a shaft of a gold(?) mine in the district of Magadan (60°N., 150°E) at a depth of 32 m. It is an iron meteorite some 10 in. in length, 5 in. in width, weighing about 15 kg, sp.gr. 7.82. On the broken surface the meteorite showed a regular triangular pattern. Chemical analysis gave C 0.4–0.5%, Ni 5–6%, the remainder being iron.

S. I. T.

EL SHAZLY (E. M.). *A new meteorite record west of Aswan, Egypt*. Journ. Geol., 1958, **2**, 71–73, 1 pl. [Summary in Arabic]

A meteorite was found in the Western Desert of Egypt

30 km to the west of Aswan approximately at latitude 23°59'10"N. and longitude 32°37'25"E. It is named the Aswan meteorite and classed as a nickel-poor ataxite. The meteorite is roughly conical in shape with 18 cm maximum width and 25 cm maximum length, sp.gr. 7.75. Available analytical data are Fe 92, Ni 5.69%.

E. M. El S.

FERREIRA (CÂNDIDO SIMÕES). *Nova análise química do meteorito Casimiro de Abreu*. Bol. Soc. Brasileiro Geol., 1956, **5**, 5–10.

The Casimiro de Abreu meteorite has been classified as a medium octahedrite (Om). Old and new analyses, with details of procedure, and normative composition are given. The calculated mineralogical composition is Fe 89.000, Ni 8.570, Co 0.630, schreibersite 1.592, troilite 0.088, lawrencite

0-190, =100-070, sp.gr. (calc.) 7-828, average of pycnometric determinations 7-807. [M.A. 11-446] A. B. R.

VINOGRADOV (A. P.). *Meteorites and the earth's crust (geochemistry of isotopes)*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 255-269, 8 figs., 23 tables.

The genesis of meteorites and igneous rocks is contrasted in the light of the distribution of their rarer elements and of the isotopes of O, S, and C. Recent work on the zonal melting of silicates is also considered. Much analytical data is presented. Two main processes are distinguished in meteorite formation: the agglomeration of chondrules, iron, and troilite to form chondrites and stony-irons; and the formation of achondrites from chondrites in an environment deficient in volatiles.

M. J. G.

[GERLING (E. K.) & LEVSKY (L. K.)] Герлинг (Э. К.) и Левский (Л. К.) Продукты космической радиации в метеорите Сихотэ-Алинь [*Products of cosmic radiation in the Sikhote-Alin meteorite*]. Доклады Акад. Наук СССР. [C.R. Acad. Sci., U.S.S.R.], 1958, **123**, 420-423, 1 fig.

Isotopic compositions of He, A, and Ne were determined in a number of samples of the Sikhote-Alin meteorite. No regular change in their amounts coinciding with depth in the meteorite body has been noted, but increased amounts occur in samples rich in troilite and schreibersite. [M.A. 14-127, 128] S. I. T.

SCHAEFFER (O. A.) & FISCHER (D. E.). *Cosmogenic noble gases in the Washington County meteorite*. Nature, 1959, **183**, 660-661.

Measurements of abundances show that the ratio $^4\text{He}/^3\text{He}$ is approximately five times that previously found for comparable meteorites. This excess ^4He is assumed to be radiogenic. It is hoped to measure the uranium content and thus obtain a helium-uranium date for the meteorite.

C. H. K.

REED (G. W.) & TURKEVICH (A.). *Uranium, helium and the ages of meteorites*. Nature, 1957, **180**, 594-596, 1 fig.

Radiogenic helium and radiogenic potassium-argon ages of stone meteorites usually agree to within 15% but cosmic-ray ages deduced from the helium-3 content are all significantly lower.

C. H. K.

[STARIK (I. E.), SHATS (M. M.) & SOBOTOVICH (E. V.)] Старик (И. Е.), Шац (М. М.) и Соботович (Э. В.). О возраст метеоритов. [*On the age of meteorites*]. Доклады Акад. Наук СССР. [C.R. Acad. Sci. U.S.S.R.], 1958, **123**, 424-426, 1 fig.

Lead-uranium determination in Russian and other meteorites suggests an age approximately 4.5×10^9 years. [M.A. 12-356] S. I. T.

MARINGER (R. E.), RICHARD (N. A.), & AUSTIN (A. E.). *Microbeam analysis of Widmanstätten structure meteoritic iron*. Trans. Metall. Soc. A.I.M.E., 1959, **215**, 56-58, 2 figs., 2 tables.

Analysis of samples from the Grant meteorite [M.A. 6-14, 8-195] by means of an electron-probe analyzer gave the concentration and distribution of iron and nickel in the various meteoritic phases. This information is tabulated. On the basis of the data presented, the authors conclude that the meteorite was at well below 400°C when fragmentation took place.

R. G. Wils.

LOVERING (JOHN F.). *The magnetic field in a primary meteorite body*. Amer. Journ. Sci., 1959, **257**, 271-277, 2 figs.

The Moore County eucrite [M.A. 11-140] cooled through the Curie temperature (about 560°C) of its magnetic constituents while in a magnetic field, and presumably while still part of the primary body of which it is a fragment. The remanent magnetization is so oriented with respect to the probable gravitationally level plane that the magnetic latitude in which this eucrite crystallized was about 10°N. or 10°S., and the presence of tridymite suggests that its depth of formation was about 10 km.

H. W.

PETTERSEN (H.). *Frequency of meteorite falls throughout the ages*. Nature, 1959, **183**, 1114.

Cosmic spherules found in long cores of sediment raised from the ocean floor show that iron and stone meteorites fell before the late Quaternary.

C. H. K.

ANON. *Bombardment of the earth by meteors*. Nature, 1957, **179**, 121-124.

Report of a geophysical discussion on 'The bombardment of the Earth by Meteors and Meteorites' held at the Royal Astronomical Society on Nov. 16, 1956.

C. H. K.

UREY (H. C.). *Chemical composition of tektites*. Nature, 1959, **183**, 1114.

References to chemical compositions of sedimentary rocks which parallel those of tektites are given in response to a request by Mason [Nature, 183-254].

C. H. K.

COHEN (ALVIN J.). *Origin of Libyan Desert silica-glass*. Nature, 1959, **183**, 1548-9.

The germanium content in p.p.m. of the glass is 0-80. Libyan Desert sands 0-52-0-95, Aouelloul Crater glass 0-64.

stony meteorites 0.09–3.02, two obsidians 1.6, and tektites from eleven localities average 0.23 ± 0.13 . The chemical analysis of the glass [M.M. 25–425] is compared

with those of the Aouelloul sandstone, its glass, and Ivory Coast tektite. It is concluded that the glass is formed from Libyan Desert materials.
M. J. Le B.

MINERAL DATA

DUVO (OLAVI), HUHMA (MAIJA), & VUORELAINEN (YRJÖ). *A natural cobalt analogue of pentlandite*. Amer. Min., 1959, **44**, 897–900, 1 fig., 2 tables.

Natural cobalt-pentlandite, $(\text{Co}, \text{Ni}, \text{Fe})_9\text{S}_8$, occurs in northern Karelia, Finland. The cobalt content varies from 0 to 50%. X-ray studies show that there is a general increase in a as the $\text{Co}:(\text{Fe}, \text{Ni})$ ratio decreases; X-ray powder data are listed for a specimen the analysis of which is $\text{Co } 42.73$, $\text{Ni } 9.78$, $\text{Fe } 13.22$, $\text{S } 34.25$. Cobalt-pentlandite is slightly lighter in colour and slightly harder than its nickel analogue; Vickers hardness values for 4 analyzed specimens are given.
B. H. B.

ARKHAM (N. L.). *Occurrence of jordanite in the Otavi Mountains, South West Africa*. Amer. Min., 1959, **44**, 682–685, 2 figs.

Jordanite ($\text{Pb}_{14}\text{As}_7\text{S}_{24}$?) was found at Kupferberg. Mineralization accompanying jordanite is discussed. Chemical analysis shows $\text{Pb } 68.34$, $\text{As } 12.75$, $\text{Sb } 0.02$, $\text{S } 18.47$, 99.58% . Small amounts of Fe , Cu , Ag , Mn , and Al are also present. Spacings and intensities of the strongest X-ray powder diffraction lines are 2.23 (10), 1.822 (8), 1.7 (7), 2.98 (7), and 2.10 (6).
A. C. H.

ROCEL (J.), HÉNIN (S.), & CAILLÈRE (S.). *Propriétés de la stainierite*. Bull. Soc. franç. Min. Crist., 1958, **81**, 189–194, 4 figs.

Stainierite [heterogenite] from the Bou Azzer mine, southern Morocco, has been examined by X-ray, d.t.a. and thermogravimetric techniques. Chemical analysis by M. L. Bouteau gave $\text{CoO } 70$, SiO_2 1.35, TiO_2 0.05, Al_2O_3 1, Fe_2O_3 3.30, Cr_2O_3 0.20, $\text{MnO } 0.35$, $\text{MgO } 1.40$, $\text{CaO } 0.85$, $\text{H}_2\text{O } 0.10$, $\text{H}_2\text{O} + 17$, $\text{H}_2\text{O} - 4$, $= 99.60$: this analysis and the thermal data indicate the formula of stainierite to be $\text{Co}(\text{OH})_2$. The nomenclature of the cobalt hydroxides is discussed.
R. A. H.

GOLOVANOV (I. M.) Голованов (И. М.). Кристаллы платтнерита из Кургашинокана [Crystals of plattnerite from Kurgashinkan.] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.] 1959, **88**(3), 333–335.

Crystals of plattnerite of acicular habit, tetragonal system, are described. The observed faces are (001), (051) and (010). Colour pitch black, opaque, reddish streak, $d < 5$; X-ray pattern similar to the standard. S. I. T.

RANDALL (B. A. O.). *Stevensite from the Whin Sill in the region of the North Tyne*. Min. Mag., 1959, **32**, 218–225, 2 figs.

Stevensite is recorded as an alteration product of pectolite in amygdale-like structures within the Whin Sill near Gunnerton, Northumberland; calcite, datolite, and chlorite are also present and at the base of the structure is a layer of 'pegmatitic' dolerite rich in sulphides and containing over 3% datolite by volume. Two varieties of stevensite occur: a fibrous variety, analysed by R. A. Chalmers, gave SiO_2 54.5, TiO_2 0.02, $\text{Al}_2\text{O}_3 < 0.1$, Fe_2O_3 0.34, $\text{FeO } 0.45$, $\text{MnO } 0.41$, $\text{CaO } 0.6$, $\text{MgO } 26.8$, $\text{Na}_2\text{O } 0.04$, $\text{K}_2\text{O } 0.09$, P_2O_5 0.01, $\text{H}_2\text{O} + 9.9$, $\text{H}_2\text{O} - 6.6$, $= 99.9$; it has straight extinction, positive elongation, and refractive indices falling into two groups with $\alpha' 1.537$, $\gamma' 1.543$ or $\alpha' 1.507$, $\gamma' 1.519$. The other variety is almost isotropic with $n 1.506$. X-ray powder data, d.t.a. curves, and staining reactions are given and compared with those for sepiolite. [M.A. 12–494, 13–263, 14–339; A.M. 1–44]
R. A. H.

GLASS (JEWELL J.), VLISIDIS (ANGELINA C.), & PEARRE (NANCY C.). *Chromian antigorite from the Wood's Mine, Lancaster County, Pennsylvania*. Amer. Min., 1959, **44**, 651–656, 1 fig.

General geology of Wood's mine is described. Chromian antigorite occurs in lavender aggregates of long, thin laths. Electron-micrograph shows thin angular plates and laths. Refr. ind. in white light are $\alpha 1.567$, $\beta 1.577$, $\gamma 1.578$, $B 0.011$. Analysis: SiO_2 36.00, Al_2O_3 7.51, Fe_2O_3 0.56, $\text{FeO } 0.45$, $\text{MgO } 37.75$, $\text{CaO } 0.00$, $\text{H}_2\text{O} - 0.24$, $\text{H}_2\text{O} + 13.16$, TiO_2 0.05, Cr_2O_3 4.36, $\text{NiO } 0.35$, $\text{MnO } 0.01$, CO_2 0.00, $= 100.44$.
A. C. H.

BRINDLEY (G. W.). *X-ray and electron diffraction data for sepiolite*. Amer. Min., 1959, **44**, 495–500, 2 figs.

X-ray powder data are indexed and tabulated; they give unit cell dimensions, $a 13.50$, $b 26.97$, $c 5.25\text{\AA}$. Electron diffraction studies confirm the b and c parameters and show that lath-like crystals develop on the (100) plane.
A. C. H.

SCHMIDT (E. R.) & HECKROODT (R. O.). *A dickite with an elongated crystal habit and its dehydroxylation*. Min. Mag., 1959, **32**, 314–324, 5 figs.

Dickite from Barkly East, Cape Province, South Africa,

occurs associated with calcite in vugs and has a very pronounced elongated crystal habit. The crystals are 33–105 μ long and 6.6–13.2 μ wide with elongation in the *a* direction; plates lying on (001) have α' 1.566, γ 1.569. Chemical analysis by R. Rethemeyer of the 6.3 to 20 μ fraction of the dickite gave SiO₂ 46.43, TiO₂ nil, Al₂O₃ 39.54, Fe₂O₃ 0.15, MgO 0.17, CaO nil, K₂O 0.02, Na₂O 0.03, ign. loss 14.20, = 100.54. Dickite from Postmasburg, associated with quartz and specularite, is also reported: it occurs in highly altered shales associated with iron ores, and especially with diasporite and zunyite. X-ray powder data and d.t.a. curves are discussed. For the Barkly East dickite the fraction smaller than 2 μ effective spherical diameter is characterized by a single endothermic peak at 600°C, while larger fractions show a double endothermal effect; this two-stage dehydroxylation on heating is attributed to a particle size effect. [M.M. 28–582, 31–381] R. A. H.

VESASALO (ARVO). *On the petalite occurrences of Tammela, SW-Finland.* Bull. Comm. géol. Finlande, 1959, **184**, 59–73.

A minor deposit of petalite and its mineralogy are described. Chem. anal. of petalite by A. Heikkinen gives SiO₂ 78.00, Al₂O₃ 17.03, Fe₂O₃ 0.01, FeO 0.03, MgO 0.00, CaO 0.00, Li₂O 4.74, Na₂O 0.07, K₂O 0.05, H₂O+ 0.00, H₂O– 0.00, TiO₂ 0.00, P₂O₅ 0.02, MnO 0.00, CO₂ 0.00, = 99.99; sp.gr. 2.366 \pm 0.003; α 1.506, β 1.513, γ 1.523 all \pm 0.001, 2V, 84°, α : α 9° \pm 1°; X-ray powder data are given. Associated with petalite are microcline-perthite, albite-rich plagioclase, quartz, muscovite, spodumene, heterosite, topaz, apatite, tourmaline, garnet, and three minerals not yet identified. X-ray powder data are given for heterosite which has cell parameters *a* 4.76, *b* 9.70, *c* 5.83Å. V. M.

SWEET (JESSIE M.). *A re-examination of uigite.* Min. Mag., 1959, **32**, 340–342.

Re-examination of the one known specimen of uigite [M.M. 5–26] and of exposures at Uig, Skye, lead to the conclusion that uigite is thomsonite (var. faröelite). Heddle's specimen yielded needles and plates which give straight extinction and which are optically negative with 1.517 < β < 1.524. The X-ray powder pattern is identical to that of thomsonite. Gyrolite is associated with the thomsonite, and analcite is also present. R. A. H.

DEFFEYES (KENNETH S.). *Erionite from Cenozoic tuffaceous sediments, central Nevada.* Amer. Min., 1959, **44**, 501–509, 3 figs.

Erionite found in Wyoming, Nevada, and South Dakota occurs in Cenozoic sediments rich in volcanic material. Previous descriptions of the mineral as orthorhombic are

incorrect. The present study by single-crystal X-ray methods shows that erionite has hexagonal symmetry. Material from Jersey Valley, Nevada, has ω 1.4711, ϵ 1.4740 (\pm 0.0005), uniaxial, +, $\gamma \parallel c$; *D* 2.070 \pm 0.01 gm/cm³. X-ray diffraction data are listed and indexed, 13.200 \pm 0.005, *c* 15.07 \pm 0.01Å. The occurrence at Jersey Valley is described. [M.M. 32–261, 343; M.A. 14–55]

A. C. H.

MARMO (V.), NEUVONEN (K. J.), & OJANPERÄ (P.). *The piemontites of Piedmont (Italy), Kajlidongri (India) and Maramba (Sierra Leone).* Bull. Comm. géol. Finlande, 1959, **184**, 11–20.

The piemontites listed in the title were examined optically, chemically, and by X-rays: (A) Piedmont, (B) Kajlidongri, (C) Maramba:

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	Mn ₂ O ₃	MnO	MgO	CaO	H ₂ O+H ₂ O+	TiO	Total
A	37.54	19.80	10.46	7.32	2.00	0.08	20.47	1.46	0.04	0.54
B	37.16	19.96	6.47	11.11	0.45	0.17	22.60	1.75	0.04	0.04
C	36.82	19.17	8.03	10.80	0.51	0.04	22.29	1.85	0.04	0.07

	α	β	γ	2V _{obs.}	2V _{calc.}	sp.gr.	aÅ	bÅ	cÅ	VÅ
A	1.751	1.781	1.812	86°+2°	90.5	3.485	8.87	5.66	10.15	459.6
B	1.742	1.767	1.805	81°+2°	80°	3.486	8.89	5.67	10.22	464.0
C	1.756	1.783	1.823	72°+3°	80°	3.511	8.89	5.67	10.17	461.1

Totals include FeO 0.00, 0.00, 0.00; Na₂O 0.13, 0.05, 0.10; K₂O 0.01, 0.00, 0.00; CuO 0.00, 0.01, 0.04; PbO 0.00, 0.00, 0.01; SnO 0.00, 0.00, 0.01 for A, B, and C respectively.

The optical properties do not fit the curves of Short and Winchell. New curves are given indicating the variation of unit cell dimensions, optical properties, and specific gravities with the chemical composition within the pistacite-piemontite series and the results discussed. Th. G. S.

SEKI (YÔTARÔ). *Relation between chemical composition and lattice constants of epidote.* Amer. Min., 1959, **44**, 720–730, 1 fig., 6 tables.

Chemical analyses, optical properties, indexed X-ray powder patterns, unit cell sizes, volumes, and packing indices are given for two clinozoisites and three pistacites. The unit cell becomes larger, from 454.5 to 461.7Å³ with *a*, *b*, and *c* all increasing, as the Fe₂O₃ content increases from 4.03 to 17.93%. Optically similar zoisite and clinozoisite can be distinguished by X-ray powder patterns: between θ 10° and 60° there are 14 characteristic peaks for zoisite and 8 for clinozoisite. B. H. B.

CHRISTOPHE-MICHEL-LÉVY (M.), EMBERGER (A.), SANDRÉA (A.). *Matériaux pour la minéralogie de Madagascar. II. La dumortierite de Riampotsy.* Bull. Soc. franç. Min. Crist., 1959, **82**, 77–79, 4 figs.

Dumortierite occurs with tourmaline, beryl, spessartine and rare kornepurine, in a pegmatite cutting micaceous quartzite 3 km south-east of Riampotsy (200 km south-west of Tananarive). It has α 1.680, γ 1.690 (both \pm 0.004

0.012; $2V_\alpha$ 37° , dispersion $v > r$, pleochroism α violet-go-blue, $\beta = \gamma$ sky blue to colourless; in sections perpendicular to the acute bisectrix (showing β and γ) polythetic twinning is observable. Chemical analysis by Patureau gave SiO_2 32.30, TiO_2 0.40, Al_2O_3 60.50, O_3 1.45, MnO 0.08, MgO 0.52, CaO 0.40, $\text{Na}_2\text{O} + \text{K}_2\text{O}$ 5, B_2O_3 1.60, P_2O_5 0.05, F 0.15, $\text{H}_2\text{O} +$ 0.48, $\text{H}_2\text{O} -$ 0.97, 9.55. The dumortierite is weakly radioactive with an equivalent of about 40–50 p.p.m. U. R. A. H.

INTER (B. H.). *Re-examination of 'struverite' from Salak North, Malaya*. Amer. Min., 1959, **44**, 620–632, 3 figs.

The analysis and description of 'struverite' given by Bok and Johnstone [M.M. 16–224] are shown to be incorrect because their samples were contaminated with monazite and cassiterite. ASTM X-ray powder data card 'struverite' (2–1354) shows a mixed pattern of 'struverite' and ilmenite. Flintner finds that the mineral is richer in niobium than in tantalum and thus should be termed 'neonorutile' and not 'struverite', but he prefers the terms 'tantalian-rutile' and 'tantalite-rutile'. A. C. H.

RAULT (GUY). *Détermination de la composition chimique du pyrochlore d'Oka par spectrofluorescence des rayons X*. L'Ingénieur, 1959, **45**, 40–46, 2 figs. 4 tables.

The Claisse fusion technique is used in this determination [A. 14–382]. The writer concludes that for minerals with many component elements of atomic numbers greater than 22 (titanium) the technique is especially useful. New data given in the text include the chemical composition of pyrochlore from Oka, Quebec; Cb_2O_5 55.8, Ta_2O_5 0.5, O_2 6.52, equivalent Fe_2O_3 (state of valency not known) 70, Na_2O 4.50, K_2O 0.00, SrO 1.09, CaO 15.08, MgO 0.00, TiO_2 0.07, ZrO_2 1.0, U_3O_8 0.45, ThO_2 0.63, Y_2O_3 0.12, La_2O_3 0.2, CeO_2 3.0, SiO_2 0.08, F 3.69, $\text{H}_2\text{O} +$ 24, = 97.37. Cell dimensions for this pyrochlore are $a = 3.88\text{\AA}$; space-group is $Fd3m$; sp.gr. 4-13. The pyrochlore from Oka, P.Q., varies in chemical composition; other partial determinations indicate a Cb_2O_5 content of 49.0%. L. G. B.

DOLLOY (MARTIN W.). *A comparative study of ten monazites*. Amer. Min., 1959, **44**, 510–532, 5 figs., 1 pl., 6 tables.

Optical and X-ray diffraction data for ten monazites are tabulated, and d.t.a. curves are figured. Monazite from Chester, Morris County, New Jersey, has α 1.775, 1.836 ± 0.002 , $2V(+)$ 16° ; colour yellow-brown, degree of opacity 75%; partial chem. anal. by Ledoux and Co., R_2O_3 53.36, ThO_2 13.66, P_2O_5 25.31, U_3O_8 0.045%. No systematic relationship between optical properties and rare earth and thorium content was not found. Relative amounts of the rare earths can be determined by X-ray

fluorescence analysis; quantitative analysis is made by emission spectroscopy. Study of alteration in monazite indicates the presence of an iron-bearing, non-hydrous, amorphous mineral or group of minerals. J. Ph.

VOLBORTH (A.). *Strontian meta-autunite from the Daybreak Mine, Mt. Spokane, Washington*. Amer. Min., 1959, **44**, 702–711, 5 tables.

A chemical analysis of meta-autunite from the Daybreak Mine, near Mt. Spokane, Washington, U.S.A., is very close to the theoretical $\text{Ca}(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 6\frac{1}{2}\text{H}_2\text{O}$ with the exception of 1.38% SrO. Indexed X-ray data and unit cell dimensions are compared with other measurements on this mineral; the cell dimensions are a 6.972, c 8.47 \AA ; a larger cell with a' 19.72 \AA was not confirmed by Weissenberg patterns. Dark blue-green, green, and yellow samples have essentially identical cell size and refractive indices. A fast reversible change between autunite and meta-autunite occurs. B. H. B.

THOREAU (J.), MEERSSCHE (VAN M.), & PROTAS (J.). *Sur la dumontite de Shinkolobwe (Katanga)*. Bull. Soc. franç. Min. Crist., 1958, **81**, 63–65.

Dumontite from Katanga [M.A. 4–313] occurs in yellow prisms, associated with meta-torbernite and parsonsite. Three new chemical analyses confirm the formula to be $\text{Pb}_2(\text{UO}_2)_3(\text{PO}_4)_2(\text{OH})_4 \cdot 3\text{H}_2\text{O}$. It has α ($= b$) 1.85, β ($\approx c$) 1.87; marked dispersion $r < v$; sp.gr. 5.65; cell parameters a 8.16, b 16.73, c 7.02, β 110° , $Z=2$, space group $P2_1/m$, or $P2_1$; X-ray powder data are tabulated. [M.A. 13–243] R. A. H.

ČECH (F.) & SLÁNSKÝ (E.). *Strunzite als Verwitterungsprodukt aus der Mn-Lagerstätte von Morašice bei Chvaletice in Ostböhmen*. Neues Jahrb. Min., Monatshefte, 1959, **9**, 200–203.

Strunzite [M.M. 31–973; A.M. 43–793], described in error as cacoxenite by Slavík occurs in the oxidation zone of the Algonkian Mn-deposit (rhodonite, rhodocrosite, neotocite, &c.) at Morašice. Spectrgr. anal. showed Fe, Mn, and P as the chief minerals; α (colourless) 1.620, β 1.669, γ (pale yellow) 1.72, γ : (fibre length) = 10° . X-ray data are tabulated. [M.A. 2–141, 4–74] J. Ph.

PIERROT (R.) & SAINFIELD (P.). *Sur la langite des Vosges*. Bull. Soc. franç. Min. Crist., 1958, **81**, 257–260, 2 figs.

Langite is recorded from the iron mine of Framont-Grandfontaine (Bas-Rhin) where it occurs as a recent deposit associated with the action of infiltrating waters on the tactite which borders the iron ore, and from the copper mine of Mollau (Haut-Rhin), where it is associated with

brochantite in proximity to chalcopyrite. It is orthorhombic, a 6.02, b 11.2, c 7.12 Å, $Z=2$; H. 3, sp.gr., 3.31; and occurs in greenish blue, faintly pleochroic, tabular crystals with $2V_\alpha \approx 70^\circ$; $\gamma=a$, $\beta=b$, $\alpha=c$; repeated twins on {110} are frequent. Chemical analysis of the langite from Mollau

gave SO_3 15.9, CuO 63.3, $H_2O + 14.2$, $H_2O - 3.7$, insol. = 99.5, confirming the formula $(SO_4)Cu_4(OH)_6 \cdot H_2O$. Index X-ray powder data are tabulated and compared with that for langite from Lostwithiel, Cornwall. [M.M. 17-33; M.A. 7-474, 8-381] R. A. H.

NEW MINERALS

PROTAS (J.). *Contribution à l'étude des oxydes d'uranium hydratés*. Bull. Soc. franç. Min. Crist., 1959, **82**, 239-272, 23 figs.

In the discussion on natural occurrences of uranium hydrates [M.A. 14-406] a new un-named mineral is described from the mine of Margnac II, Haute-Vienne, where it is found associated with altered pitchblende and in cracks in gummite. It occurs in minute, rarely as large as 0.5 mm, red-orange, orthorhombic crystals, having a pseudo-hexagonal appearances with forms {001}, {010}, {110}, and {111}; a 14.06, b 24.12, c 14.16 Å; D 5.29 g/cm³; $2V_\alpha$ 38°, β 1.94, γ 1.96: it tends to become uniaxial on heating. Partial chemical analysis gave UO_3 83.9, H_2O 7.4, and Sr and Ca were also present; the mineral is thus believed to be a complex hydrated oxide of U, Ca, and Sr. The strongest X-ray reflections occur at 3.47, 3.11 and 3.53 Å.

R. A. H.

WILLIAMS (K. L.), THREADGOLD (I. M.), & HOUNSLOW (A. W.). *Hellyerite, a new nickel carbonate from Heazlewood, Tasmania*. Amer. Min., 1959, **44**, 533-538, 2 figs.

Hellyerite, named after Henry Hellyer, is $NiCO_3 \cdot 6H_2O$. It was found as coatings associated with zaraitite on shear-planes in serpentinite at the Lord Brassey nickel mine, Heazlewood. Chemical analysis gives NiO 32.9, CO_2 22.8, H_2O 45.0, = 100.7; sp.gr. 1.97, H. 2.5; colour pale blue with weak dichroism in greenish blue; α 1.455, β 1.503, γ 1.549, $2V_\alpha \approx 85^\circ$; X-ray powder data are listed, the strongest lines being 9.4 (10), 6.06 (10), 3.65 Å (7).

A. C. H.

DORFMAN (M. D.), ROGACHEV (D. L.), GOROSHCHENKO (Z. I.), & МОКРЕТОВА (A. V.) [Дорфман (М. Д.), Рогачев (Д. Л.), Горощенко (З. И.) и Мокретьова (А. В.). Фенаксит—новый минерал [*Fenaksite—a new mineral*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **9**, 152-157, 2 figs., 2 tables.

Fenaksite is a new alkali silicate of iron which occurs in association with albite, nepheline, aegirine-augite, and eudialyte in a pegmatite body associated with an ijolite-urtite intrusion in Khibina. It is pale rose in colour,

transparent to subtransparent; H. \approx 5; two distinct cleavages make an angle of 122° ; lustre on cleavage surfaces pearly; rubbing reduces the mineral to asbestos-like aggregate; before the blowpipe melts easily to a green glass; the powder heated in a flame becomes magnetically soluble in acids with precipitation of silica; sp.gr. 2.74; O.A.P. || (001), α 1.541, β 1.560, γ (= b) 1.567, $2V_\gamma$ 84° in yellow (589.3 m μ) light, $\gamma-\alpha$ 0.026; extinction angle against cleavage I: $\gamma = 20^\circ$, cleavage II: $\beta = -49^\circ$. X-ray data give monoclinic symmetry, space group $C_{2h}2/m$; unit cell parameters a 14.95, b 6.98, c 9.79 Å, β 112° . Two chemical analyses by Mokretsova and Goroshchenko give SiO_2 60.60-54, Al_2O_3 1.10, 0.66, Fe_2O_3 1.32, 1.54, FeO 12.45, 12.4, MgO 0.46, 0.70, CaO 0.64, 0.74, Na_2O 6.77, 7.51, K_2O 11.11-7.1, $H_2O + 2.40$, 0.67, $H_2O - 0.76$, 0.78, F 0.23, 0.47, Ti 0.06, 0.04, MnO 2.34, 2.49, [= 100.15, 100.34] the resulting formula being $(K,Na,Ca)_4 \cdot (Fe^{II},Fe^{III},Mg,Mn)_2 \cdot Si_4O_{10} \cdot (OH)_4$.

N. R.

[DORFMAN (M. D.), ROGACHEV (D. L.), GOROSHCHENKO (Z. I.), & USPENSKAYA (E. I.)] Дорфман (М. Д.), Рогачев (Д. Л.), Горощенко (З. И.) и Успенская (Е. И.). Канасит—новый минерал [*Kanasite—a new mineral*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **9**, 158-166, 33 figs., 3 tables.

The mineral was discovered in the innermost zone of pegmatite associated with an ijolite-urtite intrusion in Khibina. *Kanasite* and *fenaksite* (see preceding abstract) together are probably replacement products of albite. *Kanasite* is transparent to subtransparent, with glass lustre; streak colourless; brittle with jagged fracture; two cleavage at 118° , one being dominant; rubs down to an asbestos-like 'wool'; melts easily before the blowpipe to colourless glass; dissolves in acid with precipitation of silica; sp.gr. 2.707; O.A.P. || (010), $\beta=b$, α 1.534, β 1.534, γ 1.543 in yellow (589.3 m μ) light, $\gamma-\alpha$ 0.009; $2V_\alpha$ 58.5; extinction angle against dominant cleavage 2° . X-ray data indicate monoclinic symmetry, a 18.87, b 7.24, c 12.60 Å, β 112° , space group $C_{2h}2/m$. Chemical analyses by Uspenskaya and Goroshchenko gave SiO_2 56.08, 55.7, Al_2O_3 0.55, 0.20, Fe_2O_3 1.41, 0.72, FeO 0.71, 0.36, MgO 0.04, 0.26, CaO 20.95, 20.39, Na_2O 8.01 (doubtful), 7.08, K_2O

, 10.63, $\text{H}_2\text{O} + 1.11$, 1.25, $\text{H}_2\text{O} - 0.49$, 0.60, F 2.21, Cl 0.22, —, TiO_2 0.10, 0.06, MnO 0.38, 0.41, CO_2 0.20, P_2O_5 0.04, 0.08, [=100.98, 99.92 — $\text{O} \equiv \text{F, Cl}$], correspond to the formula $(\text{Na, K, Ca})_5(\text{Ca, Mn})_4[\text{Si}_2\text{O}_5]_5(\text{F, OH})_2$.

N. R.

BURNEY (T. C.) & MURDOCH (JOSEPH). *Haiweeite, a new uranium mineral from California*. Amer. Min., 1959, **44**, 839–843, 3 tables.

Haiweeite, $\text{CaO} \cdot 2\text{UO}_2 \cdot 6\text{SiO}_2 \cdot 5\text{H}_2\text{O}$, occurs as small spherical aggregates on fracture surfaces in granite and in voids adjacent lake bed sediments. The new mineral was found above the Haiwee Reservoir, Coso Mountains, California, U.S.A. It is pale yellow to greenish yellow with a silky lustre, H. 3.5, sp.gr. 3.35. Optically haiweeite is biaxial negative, $2V \approx 15^\circ$, with strong dispersion $r > v$; $n_x = 1.571$, $n_y = 1.575$, $n_z = 1.578$. Three X-ray powder patterns are given including that of the ignited mineral tentatively considered meta-haiweeite. Weissenberg data indicate that haiweeite is probably monoclinic with $P2_1/c(C_{2h}^4)$ the likely space group and cell dimensions $a \approx 15.44$, $b \approx 7.05$, $c = 7.10 \text{ \AA}$, $2\theta = 70^\circ 52'$.

B. H. B.

ITO (TADASHI). *Ningyoite, a new uranous phosphate mineral from Japan*. Amer. Min., 1959, **44**, 633–650, 3 figs.

Ningyoite occurs in an unoxidized zone of the Ningyo-toge mine, Tottori Prefecture, [M.A. 14–401] replacing coatings to pyrite and other minerals or filling cavities and cracks in the ore. From microchemical analysis of pure material its chemical composition is presented as $_{-x}\text{Ca}_{1-x}\text{RE}_{2x}(\text{PO}_4)_2 \cdot 1\text{--}2\text{H}_2\text{O}$. The habit is acicular or elongate lonsenge shaped; brownish green or brown in colour, faintly pleochroic by transmitted light; refr. ind. uncertain, ≈ 1.64 , birefringence seems low; space group probably $P222 (D_2^3)$; $a = 6.78 \pm 0.03$, $b = 12.10 \pm 0.05$, $c = 6.38 \pm 0.03 \text{ \AA}$; $Z = 3$. X-ray powder data are tabulated along with the values for synthetic $\text{CaU}(\text{PO}_4)_2 \cdot 1.5\text{H}_2\text{O}$ which are in close agreement; strongest lines are 3.02 (vs), 2.81 (s), 2.22 (s). The synthetic compound was made from slurries of uranous phosphate and calcium phosphate heated in sealed tubes at 150° and 185°C , at pH 1.4 to 4.8; its pleochroism is γ green, α pale green; acicular, with positive elongation, α between 1.69 and 1.70, γ between 1.70 and 1.71.

A. C. H.

WIE (S. H. U.). *Note on uranium and thorium occurrences in the Federation of Rhodesia and Nyasaland*. Chronique des Mines d'Outre-Mer & de la Recherche Minière, 1959, no. 279, 5 pp. [In English and French].

A summary account of the uranium and thorium minerals and the nature of their occurrence and associations

in Northern Rhodesia, Southern Rhodesia, and Nyasaland. A new thorium mineral, approximating in chemical composition to thorium phosphate, occurs with thorite in a lithium-bearing pegmatite in the Mtoko district of Southern Rhodesia. It is pale yellow with a powdery appearance; structurally it is related to rhabdophane and other hexagonal, rare-earth phosphates. The name *grayite* has been proposed. Fourmarierite is recorded in association with pitchblende in veinlets in epidiorite in the Mpudzi River basin near Umtali, and a thorian rhabdophane, with about 16% ThO_2 , from quartzite in a breccia zone in the Sebungwe District, Southern Rhodesia. Monazite in black sands in raised beaches along the west shore of Lake Nyasa appears to be derived from aplite dykes; average thorium content of the monazite is 7.2%.

J. Ph.

McKIE (DUNCAN). *Yoderite, a new hydrous magnesium iron aluminosilicate from Mautia Hill, Tanganyika*. Min. Mag., 1959, **32**, 282–307, 5 figs., 1 pl.

The mineral *yoderite* occurs in quartz-kyanite-talc schists, and was previously wrongly identified as glaucophane or dumortierite because of its purple colour. It is monoclinic with $a = 8.10$, $b = 5.78$, $c = 7.28 \text{ \AA}$, $\beta = 106^\circ$; space group $P2_1$, or $P2_1/m$. Chemical analysis by A. J. Radford gave SiO_2 36.12, TiO_2 0.35, Al_2O_3 41.06, Fe_2O_3 0.50, FeO 4.82, MnO 0.32, MgO 12.23, CaO 1.48, Na_2O 0.01, K_2O 0.05, $\text{H}_2\text{O} + 3.20$, $\text{H}_2\text{O} - 0.05$, = 100.19, corresponding to the formula $(\text{Mg}_{2.0}\text{Ca}_{0.2}\text{Fe}_{0.5}\text{Al}_{5.3})\text{Si}_{14.0}\text{O}_{17.6}(\text{OH})_{2.4}$; sp.gr. 3.39, H. 6; $\alpha = 1.689$, $\beta = 1.691$, $\gamma = 1.715$ (all ± 0.002) and $2V_x = 25^\circ (\pm 2^\circ)$. Pleochroic scheme is α pale Prussian blue, β indigo, γ light olive green, with absorption, $\beta > \alpha > \gamma$. The optic axial plane is {010} with $\alpha : a \approx 9^\circ$ and $\gamma : c \approx 7^\circ$, both in the obtuse angle β ; directions of parting [001] good and {100} poor; elongation along the b axis. The three strongest lines on the X-ray powder pattern are 3.50 vvs, 3.03 vs, 2.61 \AA s. Yoderite crystals contain relics of kyanite and the b axis of yoderite is parallel to the c axis of kyanite. Subsidiary reflections similar to those found in low-temperature plagioclase feldspars of intermediate composition occur; they disappear on heating in the temperature range $700^\circ\text{--}820^\circ\text{C}$. Analysis by A. J. Radford of the co-existing talc gave SiO_2 63.49, Al_2O_3 3.95, total iron as FeO 0.56, MnO 0.06, MgO 26.66, CaO 0.64, $\text{H}_2\text{O} + 4.64$, $\text{H}_2\text{O} - 0.12$, = 100.12. The talc is pale flesh pink in hand specimen and has $2V_x = 6^\circ$, $\beta = 1.592 (\pm 0.002)$. The formation of yoderite as a result of reaction between kyanite and talc instead of the more usual cordierite is attributed to high pressure of water. [M.A. 14–267]

W. S. M.

BÜLTEMANN (H. W.) & MOH (G. H.). *Bergenit, ein neues Mineral des Phosphuranyl-Gruppe*. Neues Jahrb. Min., Monatshefte, 1959, 232–233.

A new barium-phosphuranylite, *bergenite*, is described,

with a composition close to that of the synthetic product $\text{Ba}(\text{UO}_2)_4(\text{PO}_4)_2(\text{OH})_4 \cdot 8\text{H}_2\text{O}$. It occurs in thin, platy, yellow, orthorhombic crystals, with α 1.660, $\beta \approx 1.690$, $\gamma \approx 1.698$, $2V_\alpha > 45^\circ$; sp.gr. > 4.1 . The X-ray powder reflections are tabulated; strongest reflections are 7-78, 3-883, 3-076Å. The name is for the Bergen an der Trieb, Saxony, locality where bergenite occurs associated with torbernite, autunite, renardite, barium uranophane [M.A. 14-344] and uranocircite.

R. A. H.

[KRUTOV (G. A.)] Крутов (Г. А.). Магнезиальный эритрин в серпентинах южного Урала и некоторые общие вопросы состава минералов ряда эритрин-аннабергит [*Magnesian erythrite from the serpentinites of Southern Urals and certain general problems of composition of the minerals forming the series erythrite-annabergite*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **9**, 59-73, 2 figs, 3 tables.

A new *magnesian erythrite* is described and its chemical analysis by M. V. Koukharchik given as SiO_2 1.54, Al_2O_3 0.12, Fe_2O_3 0.52, MgO 6.82, CoO 22.53, NiO 4.91, MnO 0.14, CuO 0.16, CaO 0.16, $\text{H}_2\text{O} +$ 23.47, $\text{H}_2\text{O} -$ 1.04, $\text{CO}_2 -$, SO_3

0.03, As_2O_5 38.23. It is suggested that the mineral originates by oxidation of cobaltite in serpentinite. The relationship of this mineral to other arsenates is discussed and concluded that while there is little evidence of complete isomorphism of Ni, Co, Fe, Zn, Cu, or Ca in arsenates, there may be a complete isomorphous transition in the series erythrite-hermesite [schwartzite] and annabergite-hermesite.

N. H.

GABRIELSON (O.), PARWEL (A.), & WICKMAN (F.). *Blixite, a new lead-oxyhalide mineral from Långban*. Arkiv Min. Geol. Stockholm, 1958, **2**, 411-415.

A new rare mineral, named *blixite*, occurring as a fissure mineral at Långban, Sweden, is described. Hardness about 3, sp. gr. 7.35; $\gamma \approx 2.20$, $\alpha \approx 2.05$, birefringence about 0.15. Blixite has orthorhombic symmetry with unit cell dimensions a $5.832 \pm 0.003\text{\AA}$, b $5.694 \pm 0.003\text{\AA}$, c $25.47 \pm 0.02\text{\AA}$. The chemical composition is PbCl_2 30.0, PbO 69.50, CaO 0.30, H_2O 0.79, = 100.75. It is shown that the water is probably essential and the formula is $\text{Pb}_{16}\text{Cl}_8(\text{O},\text{OH})_{16-x}$ with $x \approx 2.6$. If water is non-essential the formula reduces to $4\text{Pb}_4\text{Cl}_2\text{O}_3$. Powder data are also given.

K. H.

ROCK-FORMING MINERALS AND PETROLOGY

Rock-forming minerals

FERGUSON (R. B.), TRAILL (R. J.), & TAYLOR (W. H.). *Charge balance and the stability of alkali feldspars: a discussion*. Acta Cryst., 1959, **12**, 716.

The use of local charge balance calculation to indicate relative stabilities of potassium feldspars [M.A. 14-103] is discussed further in view of critical comments made by MacKenzie and Smith. [M.A. 14-284] J. Z.

MARMO (VLADI). *On the stability of potash feldspars*. C.R. Soc. géol. Finlande 31; Bull. Comm. géol. Finlande, 1959, **184**, 133-137.

The author is of the opinion that the crystallization of potassium feldspar is controlled not only by temperature but also by time. At low temperatures, if crystallization is sluggish, microcline is formed; otherwise orthoclase will be formed. The conditions during granitization are suitable for the formation of microcline; this explains the occurrence of microcline in the plutonic rocks.

K. J. N.

ROBERTSON (FORBES). *Perthite formed by reorganization of albite from plagioclase during potash feldspar metasomatism*. Amer. Min., 1959, **44**, 603-619, 7 figs.

In the Boulder batholith the orthoclase micropertthite in

the quartz monzonite and alaskite appears to have originated from plagioclase by the deuteric alteration of andesine to albite at the contact of the invading potash feldspar, followed by replacement of the albite by the potash feldspar which became perthitic.

A. C. H.

SARMA (S. R.) & RAJA (N.). *Some observations on myrmekite structures in Hyderabad granites*. Quart. Journ. Geol. Min. Met. Soc. India, 1958, **30**, 215-221, 16 figs.

Myrmekitic intergrowths observed in thin sections of granites are described and attributed to 'metamorphic breakdown of the basic component of the plagioclase feldspars under conditions of stress'. The mineralogical compositions of the granites do not however indicate the operation of this process.

A. P. S.

BAGCHI (T. C.) & CHATTERJEE (A.). *The occurrence and origin of nepheline and feldspar metacrysts in limestone along the contact of nepheline syenite, Kishenganga, Rajasthan, India*. Quart. Journ. Geol. Min. Met. Soc. India, 1958, **30**, 73-76, 4 figs.

Feldspar (mostly K-feldspar) and nepheline metacrysts in limestone in contact with nepheline syenite in the Kishenganga area of Rajasthan are described. They are considered

ve formed as a result of replacement of carbonates by
ine solutions genetically related to the adjacent
eline syenite.

A. P. S.

(E. G.) & CHAYES (F.). *Pseudoleucite in a tinguaita from
the Bearpaw Mountains, Montana*. Journ. Petr., 1960,
1, 86-98, 1 pl.

detailed chemical and micrometric modal study of the
plex pseudoleucite patches and the groundmass of a
e rock. The exacting method described was undertaken
emonstrate the manner in which chemical analyses of
rated mineral concentrates, together with accurate
al measurements, could be combined to give the bulk
ositions of complex mineral aggregates. The micro-
ic mode of the pseudoleucite, in satisfactory agreement
the chemical mode, is nepheline 29.8%, sanidine 66.2%,
ite 3.0%. A new analysis of a nepheline from York
r (Bancroft, Ontario) gave SiO₂ 43.33, Al₂O₃ 34.07,
O₃ 0.07, CaO 0.76, Na₂O 15.94, K₂O 5.56, H₂O+ 0.24,
— 0.05, residue 0.31, = 100.33.

G. M. B.

o (F.). *Notes on rock-forming minerals (8). Chemical,
optical and X-ray data on a tremolite and three actino-
lites*. Journ. Geol. Soc. Japan, 1959, 65, 563-565.

chemical analyses are reported for tremolite (A), analyst
to, in limestone from Gouverneur, New York, and for
olites from Zöptau in Mähren (B), Chester, Vermont,
A. (C), and Scotland (D), all analysed by H. Haramura.
X-ray powder data for the tremolite are tabulated
are in harmony with the space group *C2/m*. [M.A.
272]

SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	K ₂ O	H ₂ O +	Total
3.54	0.79	0.22	0.37	tr.	24.45	13.59	0.27	0.12	2.12	100.47
1.67	0.77	0.83	3.90	0.29	22.42	12.48	0.06	0.18	2.45	100.39
1.09	3.54	0.66	4.69	0.26	21.29	12.14	0.21	0.16	2.78	100.16
1.37	5.07	3.60	15.45	1.63	9.60	10.18	0.39	0.24	2.63	100.62

sp. gr.	α	γ	2V α	$c : \gamma$	$a(\text{\AA})$	$b(\text{\AA})$	$c(\text{\AA})$	β
2.964	1.602	1.629	82°	20°	9.845	18.058	5.280	75°16'
—	1.612	1.638	80°	19°	—	—	—	—
3.080	1.617	1.642	80°	19°	—	—	—	—
3.142	1.658	1.677	59°	19°	9.845	18.135	5.292	75°31'

TiO₂ —, 0.24, 0.22, 0.40; H₂O —, 0.00, 0.10, 0.12, 0.06; $r > v$, v. weak, v. weak,
ak, strong, for A, B, C, and D respectively.

R. A. H.

I (Y.), AIBA (M.), & KATO (C.). *Edenite in Sanbagawa
crystalline schists of the Sibukawa district, central Japan*.
Jap. Journ. Geol. & Geogr., 1959, 30, 233-243, 6 figs.

series of crystalline schists west of Sibukawa are
fly composed of calciferous amphibole (edenite) with
essory epidote, chlorite, quartz, sphene, magnetite,
tite, albite, and occasional diopside (β 1.685, 2V γ 58°,
 γ 43°). Analyses (A)-(D) are of edenitic amphiboles from
area. An analysis is given also of a rather more
tingitic amphibole, and X-ray powder data are tabulated
three of the amphiboles. [M.A. 9-270]

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O
A	45.88	9.96	0.60	12.38	0.72	12.76	11.69	4.06
B	48.00	5.27	4.76	15.06	0.45	10.06	10.59	2.52
C	48.11	6.94	2.04	11.77	0.62	12.92	12.11	2.72
D	48.11	6.12	2.77	10.69	0.22	14.24	11.29	3.48

	K ₂ O	H ₂ O+	H ₂ O-	Total	α	β	γ	2V α	$c : \gamma$
A	0.25	1.42	0.04	99.76	1.647	1.659	1.665	86°-93°	26°
B	1.01	2.22	0.45	100.39	1.640	1.660	1.669	71°-84°	27°
C	0.20	2.02	0.20	99.65	1.641	1.653	1.664	84°-97°	32°
D	0.82	1.93	0.20	99.87	1.636	1.651	1.660	80°-88°	34°

R. A. H.

BOSE (M. K.). *A note on 'bleached hornblende'*. Min. Mag.,
1959, 32, 177-178, 1 fig.

Examples are described from Bihar, India, of gneissic
granites in contact with amphibolites in which hornblendes
have become bleached along cleavages and grain boundaries
or preferentially along the trace of the (001) plane. The
proportion of bleached amphibole increases towards the
granite as does the amount of biotite. These two phenomena
may be correlated with an influx of alkalis associated with
hydrothermal solutions from the granite.

R. A. H.

SEKI (Y.) & SHIDÔ (F.). *Finding of jadeite from the San-
bagawa and Kamuikotan metamorphic belts, Japan*.
Proc. Jap. Acad., 1959, 35, 137-138.

SHIDÔ (F.) & SEKI (Y.). *Notes on rock-forming minerals
(11). Jadeite and hornblende from the Kamuikotan
metamorphic belt*. Journ. Geol. Soc. Japan, 1959, 65,
673-677, 2 figs.

Jadeite is recorded from jadeite-pumpellyite-lawsonite
schists in the Sanbagawa metamorphic belt of the Kantô
Mountains and of the Sibukawa district of central Japan,
and from four localities in the Kamuikotan metamorphic
belt in central Hokkaidô, where it is occasionally associated
also with stilpnomelane and quartz. Jadeite from Ino, in the
Kamuikotan area, has α 1.653, β 1.659, γ 1.668-1.671,
2V 72°, and jadeite from Meoto-iwa, in the Kamuikotan
gorge, has α 1.665, γ - α 0.020, 2V γ 75°-85°, $v > r$ strong,
 $c : \gamma$ 42°-63° ($c : \gamma_r < c : \gamma_v$). A blue-green hornblende from
an epidote-hornblende schist of the Kamuikotan series
near Mitusi, Hidaka province, has α 1.669, γ 1.691, 2V γ 56°;
 $r > v$ distinct; $c : \gamma$ 25°; α yellow, β dull green, γ blue-
green: it is associated with epidote (2V γ 79°), albite (An₃),
rutile, sphene, and brown biotite (β 1.639, γ 1.640; 2V α
7°-10°). Chemical analysis of the hornblende by H.
Haramura gave SiO₂ 42.89, TiO₂ 0.75, Al₂O₃ 13.95, Fe₂O₃
6.07, FeO 13.39, MnO 0.27, MgO 7.41, CaO 9.75, Na₂O 2.83,
K₂O 0.85, H₂O+ 1.68, H₂O- 0.00, P₂O₅ 0.01, = 99.85.

R. A. H.

NORTON (D. A.) & CLAVAN (W. S.). *The optical mineralogy,
chemistry, and X-ray crystallography of ten clinopyroxenes from the Pennsylvania and Delaware Pied-
mont Province*. Amer. Min., 1959, 44, 844-874, 11 figs.,
18 tables.

Chemical, X-ray crystallographic, and optical data are presented in tabular form for ten clinopyroxene samples from metamorphic rocks in the Pennsylvania and Delaware Piedmont Province, U.S.A. Substructural differences of these clinopyroxenes, largely augite and salite, from diopside are postulated from crystal chemical and X-ray considerations. Varied minor oxide contents account for the discrepancy between the measured optical properties and those predicted from chemical compositions. Geochemical evidence is given which indicates an igneous origin for the clinopyroxenes and later modification of composition and properties by metamorphism.

B. H. B.

BOWN (M. G.) & GAY (P.). *The identification of oriented inclusions in pyroxene crystals*. Amer. Min., 1959, **44**, 592-602, 8 figs.

The X-ray single crystal technique was applied to the study of intergrowths in pyroxenes of the diopside-hedenbergite-ferrosilite-enstatite system. For pyroxenes *c*-axis oscillation photographs were taken with FeK α radiation in two 15° ranges, symmetrically across the normals to (100) and (010). Oscillation ranges were chosen so that the photographs which show some symmetry are easy to locate accurately by Laue photographs. By comparing the photographs of composite crystals with 'standard' photographs of the pure host material (taken under same conditions), the diffraction spots given by the host may be easily separated from those due to the inclusions. Thus the nature and orientation of the inclusions can be determined. Five different combinations of host and lamellae were examined and illustrated. [M.M. 32-379]

A. C. H.

KOUŘIMSKÝ (J.). *Porovnání výsledků roentgenografických a optických method při určování pyroxenů*. [Comparison of the results of the X-ray and optical methods in determination of pyroxenes.] Silikáty, 1957, **1**, 333-344, 9 tables.

Results of optical and X-ray investigation have shown that for determination of the rhombic pyroxenes optical methods are more profitable than X-ray analysis. The X-ray analysis is preferable for identification within the series diopside-hedenbergite, especially for the differentiation of the Mn²⁺- and Fe²⁺-members. The presence of Zn²⁺ cannot be safely estimated in pyroxenes either from the optical constants or from the X-ray data. The only suitable method is chemical analysis.

J. K.

SMITH (W. W.). *Pseudomorphs after olivine in Markle basalt*. Min. Mag., 1959, **32**, 324-331, 6 figs.

Pseudomorphs after olivine in Markle basalt from Holyrood Park, Edinburgh, consist of an intimate mixture of hematite and chlorite along with a small percentage of quartz. From X-ray and chemical data it is calculated

that the air-dried pseudomorphous material contains 32.39% hematite, quartz is determined as amounting approximately 2% of the mixture, and the remainder of the sample is calculated to be a chlorite with formula $0.22M^{+}(\text{Si}_{3.27}\text{Al}_{0.73})(\text{Al}_{1.85}\text{Mg}_{2.94}\text{Fe}_{0.55}^{2+})\text{O}_{10}(\text{OH})_8$. This chlorite is considered to belong to the pennine species [M.M. 30-277] and has a c.e.c. of 24 m.e. per 100 g with Fe^{2+} as the exchangeable cation, and *a* 5.20, *b* 9.18, *c* 14.5 $\beta \approx 97^\circ$. From rotation photographs a definite epitaxial relationship was established between the chlorite and hematite, with the *c* axes approximately coincident and with the *a* axis of chlorite approximately parallel to *a* of hematite (4.97 Å): this relationship is dependent upon the structures of the two minerals both of which have sheets of oxygen atoms in hexagonal close packing. [M.A. 13-514-207]

R. A. H.

SEKI (Y.). *Petrological studies on the circum-Hida crystalline schists. I. Crystalline schists in the Gamata and Naradani district, Gifu Prefecture*. Sci. Rept. Saitama Univ., Ser. B, 1959, **3**, 209-220, 6 figs.

Chemical analyses by Y. Seki and C. Kato are reported for chlorites: (A) from biotite-garnet-chlorite-muscovite-quartz-albite schist, derived from a pelitic rock; (B) from actinolite-epidote-quartz-albite-chlorite schist, and (C) from actinolite-epidote-chlorite-quartz-albite schist, the rocks containing (B) and (C) being both derived from mafic volcanic rock; all from the Gamata district. Actinolite from an actinolite-epidote schist of the Naradani district has α 1.641, γ 1.666, $c : \gamma = 19^\circ$, $2V_\alpha$ 73° ; its chemical composition is calculated.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	H ₂ O
A	27.40	20.19	3.29	22.01	1.40	14.31	0.00	1.74
B	26.56	26.76	2.02	18.24	0.04	13.94	0.34	1.13
C	26.75	19.65	4.00	19.43	1.13	15.96	0.00	1.13

	H ₂ O—	Total	β	$\gamma-\alpha$	sign	$d_{001}(\text{Å})$
A	0.08	'100.81'	1.635	0.005	+	3.537
B	1.02	100.88	1.628	0.001	—	3.534
C	1.09	100.43	1.628	0.002	—	3.539

R. A. H.

CLIFFORD (T. N.). *A preliminary note on chromian mica from an ankerite-quartz-pyrite rock from southern Ross-shire, Scotland*. Min. Mag., 1959, **32**, 178-180.

A bright green mica forms 10-12% of an ankerite-quartz-pyrite rock associated with a fault-zone in the Moine Schist in the upper reaches of An Leth Allt, a stream draining into Loch Duich. Partial chemical analysis shows the mica contains more than 2.0% Cr₂O₃ and approximately 23% Al₂O₃. X-ray powder patterns have demonstrated that it possesses a single-layer monoclinic (1M) muscovite structure, and it is considered to be related to fuchsite. A chemical analysis of the rock by E. Padget gave SiO₂ 39.43, TiO₂ 0.41, Al₂O₃ 2.91, Fe₂O₃ 0.72, Cr₂O₃ 0.33, FeO 3.55, MnO 0.04, MgO 9.03, CaO 17.27, Na₂O 0.25, K₂O 0.83, H₂O+ 0.04, H₂O— 0.33, CO₂ 24.58, =100.20.

R. A. H.

EADGOLD (I. M.). *A hydromuscovite with the $2M_2$ structure, from Mount Lyell, Tasmania*. Amer. Min., 1959, **44**, 488-494, 2 figs.

Chemical analysis of the fine grained mica from this locality shows it to be a hydromuscovite. The X-ray powder pattern is similar to a $2M_2(6M)$ mica polymorph. Differential thermal analysis was made. A. C. H.

URIS (L.). *Pegmatites à allanite et molybdénite dans le granite de Ploumanac'h (Côtes-du-Nord)*. Bull. Soc. franç. Min. Crist., 1958, **81**, 150-153, 3 figs.

Pegmatites in the red Ploumanac'h granite near the village of La Clarté, west of Perros-Guirec, Brittany, contain red microcline, pink oligoclase, grey quartz, black amphibole, black mica, and pitch-black allanite. The allanite occurs in large crystals (up to 11.5×3 cm.) and is surrounded by feldspars showing radial fissures due to the increase in volume of the allanite on metamictization. Chemical analysis of the allanite gave SiO_2 40.45, TiO_2 0.18, Al_2O_3 11.07, Fe_2O_3 17.81, Ce_2O_3 8.30, La_2O_3 4.25, Y_2O_3 1.50, ZrO_2 1.50, MnO 0.15, MgO 0.50, NiO 0.25, PbO 0.20, CaO 0.30, Na_2O 0.10, ign. loss 0.60 = '99.66'; spectrographic analysis showed also V 200, Cr 100, B 50, Cu 50, Mo 50, Fe 50, Be 5, and Ag 2 p.p.m. Semi-quantitative spectrographic analyses are given for the other minerals of the pegmatite. R. A. H.

AMA (J. T.). *Présence de scapolite dans les projections volcaniques de la carrière du Chauquet Genestoux (Puy-de-Dôme)*. Bull. Soc. franç. Min. Crist., 1959, **82**, 95-96, 1 fig.

Bluish grey prismatic crystals ($1 \times 1 \times 1.5$ cm) of scapolite penetrated by long brown needles of apatite are surrounded by a thin white film of an unidentified mineral, within a friable trachybasalt. The scapolite has n_x 1.568, n_y 1.597 and is anomalously biaxial with $2V < 10^\circ$: spectrographic analysis shows small quantities of Sr and Cr. R. A. H.

OUSSE (R.). *Explication de la présence de cristallites basiques dans les verres acides*. Bull. Soc. franç. Min. Crist., 1958, **81**, 112-116, 7 figs.

Basic crystallites should not be considered as products of crystallization as it can be shown that they have been formed by ions expelled from the volcanic magma, still in a molten state, in such a way as to allow the formation of a glass. R. A. H.

YASHIRO (AKIHO). *Notes on rock-forming minerals (5). Pyralospite and staurolite in a schist from Vermont*. Journ. Geol. Soc. Japan, 1958, **64**, 649-650.

Chemical analyses by H. Haramura are presented

for somewhat heterogeneous (11.52-11.56 Å) almandine garnet (A) and staurolite (B) from a coarse-grained kyanite-staurolite-garnet-biotite-muscovite-quartz schist of the Hoosac formation, from 16 miles N.W. of Bellows Falls, Vermont, (for the staurolite the total iron content is given as FeO).

	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O
A	37.42	22.31	0.82	2.28	29.46	1.12	2.83	2.85	0.77
B	26.45	53.17	1.25	—	14.31	0.20	2.27	tr.	0.62

	K_2O	$\text{H}_2\text{O}+$	$\text{H}_2\text{O}-$	P_2O_5	Total
A	0.12	0.23	0.18	0.05	100.44
B	0.11	0.57	0.03	0.04	99.02

R. A. H.

MIYASHIRO (AKIHO). *Notes on rock-forming minerals (7). Garnet of borolanite with an appendix*. Journ. Geol. Soc. Japan, 1959, **65**, 392-393.

Borolanite from Loch Borolan, Assynt, Scotland, has potassium feldspar with α 1.520, γ 1.528, $2V_\alpha$ 52° - 76° , together with biotite having γ 1.633, $2V$ 0° , α pale yellow, $\beta = \gamma$ dark brownish green, and yellow to deep brown, rounded garnet with a 12.06 Å. Chemical analysis of the melanite garnet (containing a small amount of sphene) by H. Haramura gave SiO_2 33.94, TiO_2 3.88, Al_2O_3 3.89, Fe_2O_3 23.02, FeO 1.23, MnO 0.53, MgO 0.24, CaO 32.99, Na_2O 0.49, K_2O 0.21, $\text{H}_2\text{O}+$ 0.11, $\text{H}_2\text{O}-$ 0.00, P_2O_5 tr., = 100.53. In an appendix the relation between the cell edge of garnets and 2θ values for $\text{CuK}\alpha_1$ radiation for their 640 and 642 reflections are tabulated. R. A. H.

MIYASHIRO (AKIHO). *Notes on rock-forming minerals (6). Garnet in nepheline-syenite of the Fukushima-zan district*. Journ. Geol. Soc. Japan, 1959, **65**, 171-172.

Nepheline-syenite from Shachô-zan, in the Fukushima-zan district of Korea, contains microcline ($2V_\alpha$ 86° , γ 1.527), water-clear albite ($2V_\gamma$ 68° , γ 1.539), nepheline, grandite garnet, and small amounts of green biotite, sphene, and sodalite. Chemical analysis of garnet by H. Haramura showed it to be dominantly andradite with subsidiary grossular: SiO_2 33.85, Al_2O_3 11.07, TiO_2 0.84, Fe_2O_3 18.67, FeO 0.76, MnO 0.88, MgO 0.15, CaO 32.51, Na_2O 0.49, K_2O 0.17, $\text{H}_2\text{O}+$ 0.35, $\text{H}_2\text{O}-$ 0.08, P_2O_5 tr., = 99.82; a 12.00 Å. The paragenesis of garnet in nepheline-syenites is discussed briefly. R. A. H.

SEN (SUDHIR). *Differential thermal analysis and thermogravimetric analysis studies on gypsum*. Bull. Centr. Glass & Ceramic Res. Inst., 1958, **5**, 93-105.

Differential thermal analyses of gypsum from different sources indicate that the mineral shows dehydration to soluble and insoluble forms. It is shown that the dehydration process is a continuous reaction beyond the

hemihydrate level and that gypsum can be dehydrated to lower combined water contents.

A. P. S.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MgO	CaO	Na ₂ O	K ₂ O	H ₂ O+	H ₂ O	T
A	69.90	15.46	0.95	2.83	1.20	0.49	5.60	1.14	2.07	0.32	100
B	76.80	10.25	0.37	2.44	1.32	1.38	4.52	0.63	0.87	0.18	99

Totals include TiO₂ 0.73, 0.84, P₂O₅ 0.02, 0.02, MnO 0.09, 0.10 for A and B respectively.

E. J. & A. S.

Petrography : regional

HJELMQVIST (S.). *Förekomsten av tungmineral i kaolinen på Ivö*. Sveriges Geol. Unders., 1959, ser. C, 569, 13 pp., 7 figs., 1 table.

On the island of Ivö in N.E. Scania a reddish quartz-rich, Fe-Mg-poor perthite granite of late Archean age has been deeply kaolinized in pre-Senonian time. Samples of crude kaolin, taken from different parts of the pit, were washed, and the heavy minerals then separated with acetylene tetrabromide and Clerici's solution. The heavy fraction was dominated by topaz together with secondary siderite and at times biotite. The fraction of sp. gr. > 3.73, contained zircon, spinel, various ore minerals, including small quantities of cassiterite, and small amounts of rutile, garnet, and epidote.

G. S.

LAMEYRE (JEAN). *Le complexe volcanique de la partie nord du synclinal oriental du massif des Grandes Rousses*. C.R. somm. Soc. géol. France, 1957, 7, 157-160.

The Hercynian syncline of Grandes Rousses, stretching from Le Freney in the south to the col of Le Chaput in the north is composed of a thick volcanic series including akeritic trachytes, trachyandesites, rhyolitic tuffs, and dacitic rhyolites. The beginning of the volcanism is referred to the Lower Stephanian. Five analyses are of trachyandesite, (Col de la Croix de Fer), trachyte (Gr. Rousses), rhyolite (glacier de St.-Sorlin), rhyolitic tuff (Col de la Croix de Fer), sericitic rhyolitic tuff (gorge of the Châlets de Téchette).

E. J. & A. S.

GRAINDOR (MAURICE-J.) & ROBLLOT (MARIE-MADELEINE). *Géologie des Minquiers. Premières observations*. Bull. Soc. géol. France, 1957, 7, 221-228.

The marine platform of the Minquiers comprises, from N.W. to S.E., four complexes of rocks : gneiss and migmatites which are the oldest ; diorites and granites which are more recent rocks.

E. J. & A. S.

GAGNY (CLAUDE). *Pétrographie et sédimentologie des tufs albitophyriques marins des environs d'Oderen (Vosges méridionales)*. C.R. somm. Soc. géol. France, 1957, 7, 389-391.

The shales and graywackes of Viséan age of the Oderen area have interstratified bands of volcanic tuff formed of albitic and andesinic material with ashy or microbreccia structure : analyses by P. Blot, (A) tuf microbréchiq, (B) tuf cendreux.

PALM-LAZARD (C.). *Contribution à l'étude pétrographique des andésites du Cantal*. Bull. Soc. franç. Min. Crist. 1959, 82, 43-49, 7 figs.

The andesites of Cantal are porphyritic, glassy, or hyaloclastic rocks including augite andesites, augite-hypersthene andesites, and pyroxene-poor andesites. The zoning of the plagioclases has been studied in detail; there is evidence for the exsolution of clinoenstatite from augite phenocrysts as well as the progressive transformation of hypersthene to titaniferous augite.

R. A. H.

AUTRAN (ALBERT) & GUITARD (GÉRARD). *Sur le granite de Mont-Louis (Pyrénées Orientales)*. Bull. Soc. géol. France, 1957, 7, 245-270, 1 pl.

The granite of Mont-Louis is not rooted in depth ; it is emplaced between a floor of augen-gneiss, which occupies the middle of the eastern part of the massif, and the Palaeozoic cover. The upper part of the granite is homogeneous, the lower part heterogeneous. Over wide stretches the granite is porphyritic ; it has the composition of a biotite-granodiorite, passing to granite. At Conflent east of Mont-Louis, there is at the base a biotite-quartz diorite formed by replacement of the schists and gneisses, then porphyritic or normal granodiorite, finally at the top a leucocratic granite with muscovite or two micas. Problems discussed are—nature of the metamorphic changes in the granitized regions, nature of the feldspars, conditions of emplacement, comparison with the Quérigut granite. The chemical analyses of this granitic assemblage are given.

E. J. & A. S.

KVALE (A.). *Gefügestudien im Gotthard massiv und angrenzenden Gebieten*. Schweiz. Min. Petr. Mit. 1957, 37, 399-434 (English summary).

In synclines between the crystalline massifs the post-Hercynian rocks develop a flow cleavage (Schieferung) generally parallel to the bedding and a lineation (Striemung) rarely deviating more than 20° from the cleavage direction. Biotite diagrams show the rocks as B-tectonites with the axis || lineation. Orientation of minerals took place on planes || cleavage and growth proceeded with greatest ease in the direction of movement. In the crystalline rocks of the Gotthard and Tavetsch massifs lineation is parallel to that of the younger rocks but within the massifs lineation is in a different direction and probably of pre-Alpine age. In the Aar massif lineation corresponds with that of the younger rocks.

J. Ph.

S (L. VAN DER). *Petrology of the northern Adula region, Switzerland (with particular reference to the glaucophane-bearing rocks)*. [Thesis, State University of Leiden, Holland]. Leidse Geol. Med., 1959, **24**, 415-598, 36 figs., 5 maps, 1 section, 37 tables. (Summaries in English, Dutch, and German). Appendix by A. R. BLOEMENA. *Wilcoxon's two-sample test*. [Rept. 1957-37(1), Statistics Dept., Math. Centre, Amsterdam.] Op. cit., 1959, **24**, 599-602.

After a complete geological treatment of the northern part of the Adula nappe, the minerals and rocks are described. In the petrological consideration of chemical composition of the rocks point-counter analysis and statistics play an important role. Three main phases of Alpine metamorphism are distinguished.

About 55 minerals are described; most are common minerals of the green-schist, epidote-amphibolite, and glaucophane-schist facies. Chemical analyses, X-ray diffraction data, and optical properties are given for blue-green amphibole, chloritoid, almandine, ferrian phengite, and melanite; X-ray data for 19 garnets, phengite, and a sodopyroxene; and optical properties for albite, ferro-pargasite, glaucophane, crossite, 14 chlorites, kyanite, scapolite, phengite, and 7 soda-pyroxenes. Chloritoid is a mineral of monoclinic and triclinic types.

The rocks include phengite-gneisses, presumably of magmatic origin, amphibolites and allied rocks (sodapyroxene rocks, mica-schists), and Mesozoic rocks of sedimentary or igneous derivation. Three new chemical analyses of rocks are given, and 36 chemical compositions are derived by a precisely described method of calculation. Differences between groups of rocks and the deviations within groups are statistically established. General considerations on the three Alpine metamorphisms are outlined. The distribution of glaucophane coincides in the main with that of post-Palaeozoic compression. A bibliography of the most important literature on glaucophane and lawsonite is given.

P. C. Z.

DE JONG (G. DE). *Geologie des Ida ou Zal, Maroc*. Leidse Geol. Mededelingen, 1957, **23**, 1-209, 87 figs., 5 maps. (English summary.)

Detailed field observations on the topographical and geological features of the igneous and sedimentary rocks, occurring in the area of Ida ou Zal, are given in the stratigraphical section. The stratigraphical sequence covers formations from the infra-Cambrian up to and including the Tertiary. In the chapter on petrography macro- and microscopical descriptions are given of representative samples of the infra-Cambrian (Adoudounien) and the Géorgian-Cambrian volcanics, the Hercynian intrusive, the fissure rocks from Jebel Mzoug, Triassic dykes, a volcanic neck

south of Zarhenrhin, and Triassic basalts. The origin of an iron ore occurrence at Agadir ou Anzizen is considered.

C. J. O.

BELLAIR (PIERRE). *La phonolite de Maharouga (Châti, Fezzan)*. C.R. somm. Soc. géol. France, 1957, **7**, 289-291.

Further occurrences of phonolite have been found by Freulon and Lefranc to the north of Djebel Fezzan. Chem. anal. of the Maharouga phonolite is SiO_2 55.40, Al_2O_3 20.25, Fe_2O_3 3.40, FeO 1.30, MnO 0.17, MgO 0.60, CaO 1.50, Na_2O 7.80, K_2O 6.20, $\text{H}_2\text{O} +$ 2.55, $\text{H}_2\text{O} -$ 0.35, TiO_2 0.30, P_2O_5 0.05, = 99.87. The author has collected 17 analyses of phonolite of the same type in different African occurrences.

E. J. & A. S.

BAKER (C. O.), MARMO (V.), & WELLS (M. K.). *The ijolites at Songo, Sierra Leone*. Colonial Geol. Min. Resources, 1956, **6**, 407-415, 4 figs., 1 pl.

A banded ijolite, associated with infrequent schlieren of urtite and cut by an ultrabasic dyke, is described. The main constituents of the ijolite are nepheline and a pyroxene of the diopside-hedenbergite series, with accessory apatite, iron ore, zeolites, and cancrinite. The ultrabasic dyke consists largely of strongly pleochroic (deep brown to deep green) amphibole, $2V_x$ 70° , believed to be kataphorite, together with a small amount of melanite garnet.

R. A. H.

WELLS (M. K.) & BAKER (C. O.). *The anorthosites in the Colony complex near Freetown, Sierra Leone*. Colonial Geol. Min. Resources, 1956, **6**, 137-158, 5 figs., 3 pls.

The largest mass of anorthosite and other bodies related to it are shown to be lenticular and concordant with the layering which is a conspicuous feature of the complex. Repetition of the rock types, with troctolites at the base of each unit and anorthositic rocks towards the top, is taken to show that the anorthosites are products of differentiation essentially in situ. In the anorthosites proper the range of composition of the plagioclase is limited to An_{56} to An_{64} . [M.A. 2-315]

R. A. H.

HYTÖNEN (KAI). *On the petrology and mineralogy of some alkaline volcanic rocks of Toror Hills, Mt. Moroto, and Morulinga in Karamoja, northeastern Uganda*. Bull. Comm. géol. Finlande, 1959, **184**, 75-134.

Petrology and mineralogy of the Tertiary alkaline volcanic rocks of Toror Hills (natrolite- and analcite-bearing tinguaites), Mt. Moroto (mainly phonolites, trachytes, trachybasalts and olivine-melanephelinites), and Morulinga (olivine-melanephelinite), all in Karamoja, are described. Five rock analyses and nine mineral analyses

(nepheline, alkali-feldspar, three clinopyroxenes, basaltic hornblende, two olivines, 'iddingsite') are presented as well as the optical properties, unit cell dimensions, and powder patterns of the analyzed minerals. Special attention is given to the crystallization history of the Toror Hills tinguaites; the powder data for aegirine-augite, natrolite, and Ba-bearing K-monalcite [Schneider & Laves, *Zeits. Krist.*, 1957, **109**, 241] in these rocks are given. V. M.

[MARKHININ (E. K.)] Мархинин (Е. К.). Кварцево-оливиновый дацит с острова Кунашир. [*Quartz-olivine dacite from Kunashir island*]. Бюлл. Вулкан. Станции. Акад. Наук СССР. [Bull. Volc. Stn., Acad. Sci. U.S.S.R.], 1957, no. 26, 101-107, 7 figs.

Kunashir is the southernmost island of the Kurile chain. A quartz-olivine dacite forming a dome of the Mendeleeff volcano contains about 50% of spherical inclusions embedded in a groundmass rich in glass. The inclusions contain a considerable amount of porphyritic quartz surrounded by reaction rims of glass and pyroxene. Small amounts of olivine are also present in the rock; the optical constants of the olivine are α 1.662, γ 1.701, $2V$ (+) 89° . Chemical analysis of the rock gave SiO_2 61.80, TiO_2 0.25, Al_2O_3 20.29, Fe_2O_3 1.43, FeO 4.12, MnO 0.12, MgO 1.89, CaO 5.96, Na_2O 3.18, K_2O 0.61, H_2O 0.40, = '100.20'.

S. I. T.

[LEBEDINSKY (V. I.) & K'o-MIN (Mo)] Лебединский (В. И.) и Кэ-минь (Мо). О явлениях ликвации в лавах Калганского комплекса (КНР) [*On the phenomena of liquation in the lavas of the Kalgan complex (Chinese People's Republic)*]. Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Geol. Ser.], 1958, no. 12, 64-72, 7 figs.

Among the pre-Cambrian lavas of the Kalgan district in Northern China a perlitic liparite containing brownish drop-like spherulites and spherulitic aggregates, was found. The groundmass is glassy with a few phenocrysts of sanidine and quartz. The spherical and flattened spherulites are composed of minute radial fibres of a colourless mineral of positive elongation, grey interference colours and n below 1.54. Chemical analysis of groundmass and spherulites respectively gave SiO_2 67.51, 72.79, TiO_2 0.16, 0.13, Al_2O_3 12.89, 12.40, Fe_2O_3 2.38, 2.04, FeO 0.50, 0.24, MnO 0.04, 0.03, MgO 0.90, 0.36, CaO 1.56, 0.77, Na_2O 2.27, 3.90, K_2O 1.67, 3.12, P_2O_5 0.04, 0.04, CO_2 0.16, 1.94, $\text{H}_2\text{O} +$ 5.28, 2.24, $\text{H}_2\text{O} -$ 4.65, 1.94, = 100.01, '100.10'. It is suggested that this rock is a solidified emulsion produced by liquation of an acid magma. Spherulitic recrystallization occurred in the already solidified droplets.

S. I. T.

KRISHNAN (M. S.). *Volcanic episodes in Indian geology*. Journ. Madras Univ., 1957, **27**, no. 1, Centenary number.

The volcanic and metavolcanic rocks of India described and the sequence of volcanic activity traced. Brief descriptions of the geological setting and petrography of the volcanic rocks of various ages are given, and the relationship of some of these rocks is discussed. An excellent review of volcanism in India.

A. P. S.

WEST (W. D.). *The petrography and petrogenesis of forty-eight flows of Deccan Trap penetrated by borings in western India*. Trans. Nat. Inst. Sci. India, 1958, **1**-56, 3 pls., 1 map.

Describes in detail the petrography, mineralogy and chemistry of forty-eight Deccan trap flows. Three distinct types are recognised: basalts with phenocrysts of labradorite and occasional olivine; basalts with phenocrysts of bytownite, augite, and olivine; picrite basalts with phenocrysts of olivine and augite. Mineralogical variations in these types, disclosed by the compositions of their olivine and pyroxenes as deduced from optics and partial analyses, are described. The evolution of the types, by fractionation of a common Deccan Trap basalt magma, followed by sinking of olivine, pyroxene, and feldspar phenocrysts, is considered unlikely as the olivines in the more basic basalts are more magnesian, than in normal Deccan basalt, pyroxenes richer in lime and poorer in iron and the feldspars more calcic. It is suggested that the parental basalt had already differentiated by the sinking of early formed crystals, which would on remelting give rise to liquids of varied composition, yielding on crystallization, magnesian olivines, diopsidic pyroxenes, and calcic plagioclases. The paucity of sufficient volume of olivine basalts in the Deccan basalt province rules out their parent magma being of olivine basalt composition. Differentiation where it occurred has followed two trends, an earlier leading to production of picrite basalts and rhyolites, forming a complementary pair, and a later yielding alkaline types. It is concluded that in the Indian region a tholeiitic parental magma has given rise to both calc-alkaline and alkaline lines of evolution. Ten new analyses of Deccan basalt differentiated, three partial analyses of olivine and pyroxene phenocrysts, a wealth of optical data on the mineral phases present, and petrographic data on the rocks are given in this monograph.

A. P. S.

BOSE (MIHIR KUMAR). *On the dyke rocks of Champua and Keonjhar*. Quart. Journ. Geol. Min. Met. Soc. India, 1958, **30**, 125-139, 16 figs.

Mafic and ultramafic dykes are intrusive into the schists and gneiss around Champua in Keonjhar, Orissa. Chloritized and saussuritized mafic dykes having a north-south trend are considered part of the Newer dolerite series. Ultramafic dykes are relatively fresh assemblages.

enstatite, olivine, and diopsidic augite and are regarded as younger than the gneisses because of the lack of signs of deformation. Optical data on some minerals, and chemical analyses of two rocks are given. [The calculation of the form of one rock is incorrect.]

A. P. S.

ARBADHIKARI (TIMIR RANJAN). *An orthopyroxene-bearing rock from near Tinpahar in the Rajmahal Hills area.* Quart. Journ. Geol. Min. Met. Soc. India, 1958, **30**, 221-227, 3 figs.

The petrography and chemistry of an 'andesite' intrusive into Rajmahal trap flows from which it differs in mineralogy and texture are described. The genesis of this rock is attributed to assimilation of intertrappean sediments by basaltic lavas.

A. P. S.

BAKSI (SUBHENDU KUMAR). *Geology of the area around Dharampur Rajmahal Hills, Bihar, with special reference to the petrology of Rajmahal traps.* Quart. Journ. Geol. Min. Met. Soc. India, 1958, **30**, 49-71, 17 figs.

The chemistry and petrography of 6 different flows of Rajmahal traps are studied. The rocks have two generations of plagioclases, groundmass An_{49-56} , and phenocrysts An_{67-73} . The groundmass pyroxenes are pigeonite with W 10° - 28° while the phenocrysts are augites with $2V$ 4° - 54° . Analyses of flows from the lower, middle, and upper horizons are given.

A. P. S.

GREEN (D. H.). *Geology of the Beaconsfield district, including the Anderson's Creek ultrabasic complex.* Rec. Queen Victoria Mus., Launceston (Tasmania), 1959, new ser., no. 10, 25 pp., 6 figs.

Cambrian sediments were intruded during the Upper Cambrian by ultrabasic and basic rocks. The main rock type is partially or completely serpentinized enstatolite, with lesser peridotite and clinopyroxene-rich rocks. Pyroxene gabbros occur as a belt of minor intrusions within the complex and show partial or complete alteration to rodingites; small albitite bodies also occur within the complex. The garnetized gabbros or rodingites contain clinopyroxene partly replaced by chlorite and garnet, zoisite or clinozoisite, serpentine, chlorite, and colourless garnet. It is considered that features of the contact of the gabbros are consistent with their intrusion into the ultrabasic rock followed by the serpentinization of the ultrabasic rock [a somewhat different interpretation to that of Baker, see following abstract]. A keratophyre is also recorded and contains clinopyroxene crystals partially replaced by numerous amphibole prisms all in the same crystallographic orientation within each clinopyroxene relic. X-ray powder diffraction data include tabulated d -spacings for orthopyroxene, garnierite, and grossular.

R. A. H.

BAKER (G.). *Rodingite in nickeliferous serpentinite, near Beaconsfield, northern Tasmania.* Journ. Geol. Soc. Australia, 1959 (for 1958), **6**, 21-35, 4 figs.

Rodingite with associated lime silicates including vesuvianite, grossular, prehnite, pectolite, and members of the epidote group, occurring in the ultrabasic-basic igneous complex of the Anderson's Creek district, is considered to have been derived from hornblende gabbro by a process of lime metasomatism which antedated the intrusion of serpentinite. Analyses by A. W. Hounsflow are given for garnierite (A) with refr. ind. 1.554-1.570 from the serpentinite, grossular (B) with n 1.735 from the rodingite, hornblende (C) from the hornblende gabbro, altered hornblende (D) from the rodingite, and the Anderson's Creek rodingite itself (E).

	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	H ₂ O+	H ₂ O-	Total	sp.gr.
A	47.98	—	0.82	1.42	0.13	—	22.62	0.09	8.09	8.10	99.93	—
B	38.76	0.15	21.88	1.08	0.95	nil	nil	36.10	0.99	0.05	99.96	3.50
C	43.14	1.53	11.36	1.47	14.41	0.23	13.91	10.94	1.09	0.04	100.18	—
D	27.96	0.15	20.89	1.28	16.28	0.05	21.64	0.56	11.06	0.25	100.12	2.85
E	35.61	0.15	21.59	1.14	5.41	0.02	6.30	25.75	3.93	0.11	100.01	3.30

Totals include: A, NiO 10.68, CO₂ nil, P₂O₅ nil; B, Cr₂O₃ tr., CO₂ nil, P₂O₅ tr.; C, Na₂O 1.58, K₂O 0.31, CO₂ nil, P₂O₅ 0.10, Cl 0.07; D and E, CO₂ nil, P₂O₅ nil.

[M.M. 30-525]

R. A. H.

Petrology : metamorphic

WEYMOUTH (J. H.) & WILLIAMSON (W. O.). *Some effects of artificial heating on fluorite-bearing albite-granite from St. Austell, Cornwall.* Geol. Mag., 1957, **94**, 69-80, 1 pl., 1 fig., 2 tables.

'Hard purple' chinastone, consisting chiefly of albite, quartz, muscovite, microperthite, fluorite, and topaz, was heated in air at various temperatures up to 1300°C. The changes undergone by the different minerals were noted. The invasion of cleavages and cracks in the heated quartz by feldspathic glass resembled phenomena in certain xenoliths. The conditions which produced glass when powdered granite was heated unconfined or in a bomb are described.

M. G. B.

SEN GUPTA (SUPRIYA). *Incipient crystal structures from para-lavas of Jharia coalfield and their implications.* Quart. Journ. Geol. Min. Met. Soc. India, 1958, **30**, no. 2, 77-81, 1-4 figs.

Describes globulites, trichites, margarites, sphenelites of cordierite, trydimite and magnetite from fused shales. The shapes and character of these incipient crystals are attributed to the physical conditions prevailing during their crystallization.

A. P. S.

CHAKRABORTY (K. L.). *Metamorphism of the banded iron formation of Badampathar, Mayurbhanj, India, and the origin of the cummingtonite-magnetite rock.* Proc. Nat. Inst. Sci. India, 1958, **24**, pt. A, 386-391, 1 fig., 1 pl.

Cumingtonite-magnetite rocks have been formed by contact metamorphism of banded hematite quartzite, by addition of MgO, CaO, etc., from basic intrusives. The cumingtonite has γ 1.665, γ :c 13°, 2V 88°. A. P. S.

MORIMOTO (RYŌHEI). *Note on the inclusions of some andesites from Setouchi region, south-western Japan.* Proc. 7th Pacific Sci. Congr. (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 301–307, 4 figs.

Inclusions of metamorphic rocks and xenocrysts of garnet have been described from many localities in the andesite of dissected volcanoes of the Setouchi (Inland Sea) region. References to previous papers, mainly in Japanese, on these rocks are given. The present paper describes and tabulates the main mineralogical changes observed in xenoliths of medium to high grade schistose rocks of pelitic composition in the garnet-biotite andesite of Nijō volcano, near Osaka. The schists, originally of the garnet, staurolite, or sillimanite zones, show first the development of a hornfels texture and then growth of biotite and calcic plagioclase. At the same time cordierite, andalusite, and sillimanite develop; corundum and green spinel may also appear. Later, glass begins to form and the porphyroblasts of cordierite, etc., are gradually replaced by andesine. In the final stage the xenoliths are composed of biotite and plagioclase, and may later disintegrate. The garnet (almandine) in the lava is believed to be derived originally from the xenoliths. The enclosing andesite is described petrographically and two analyses by S. Tanaka and T. Ando given. It is suggested that the unusual features of this rock are partly due to contamination. Xenoliths in other lavas from this region are briefly described. W. A. W.

CHRISTOPHE-MICHEL-LÉVY (M.). *Sur un cas particulier de schiste noduleux à diaspoire d'Heas (Pyrénées).* Bull. Soc. franç. Min. Crist., 1959, **82**, 96–97, 2 figs.

Vermicular diaspoire, surrounded by chlorite and sericite, is reported from nodules in a garnet-biotite schist. It is suggested that these nodules are pseudomorphing cordierite in a hyperaluminous rock. R. A. H.

SEKI (Y.). *Petrological study of hornfelses in the central part of the median zone of Kitakami Mountainland, Iwate Prefecture.* Sci. Rept. Saitama Univ., ser. B., 1957, **2**, 307–361, 20 figs., 2 pls.

Palaeozoic sediments, volcanic rocks, and sheared granites were intruded by the batholithic Tono granodiorite giving straightforward thermal metamorphism on its western margin and thermal metamorphism accompanied by moderate or intense shearing on its eastern margin giving

rise to chloritoid-bearing hornfelses. The anthophyllite cordierite and chloritoid hornfelses are abnormally rich in Fe, Mg, and Al and are derived from slates mixed with volcanic materials. Detailed mineralogical and petrological descriptions are accompanied by 24 rock analyses. R. A. H.

FRENCH (W. J.) & PITCHER (W. S.). *The intrusion-breccia of Dunmore, Co. Donegal.* Geol. Mag., 1959, **96**, 69–71 pl., 2 figs.

Dalradian limestones and pelitic schists have been brecciated and locally altered by a gas phase which seems to have preceded the intrusion of a porphyritic felsite with lamprophyric affinities. Alteration of the abundant limestone blocks is generally restricted to a surface layer where epidotic minerals, sphene, calcite, and pale green amphibole are developed in association with feldspathic veins. W. J. W.

JUAN (V. C.), WANG (Y.), & SUN (S. S.). *Hydrothermal alteration of dacite at the Chinkuashih mine, Taipei, Taiwan.* Proc. Geol. Soc. China [Formosa], 1959, not (for 1958), 73–92, 9 figs.

The biotite-dacite wallrock of a gold-bearing orebody has undergone hydrothermal alteration with the successive development of chloritized, argillized, and silicified zones distributed around mineralizing conduits. A petrographic, mineralogical, and chemical study includes the chemical analyses of the fresh biotite-hornblende-augite-hypersthene-dacite and of the altered dacite of the three zones. Change of chemical environment in terms of pH of the solution is considered to be the main factor. Two cycles of chemical change are recognized: in the pre-ore cycle pH of the mineralizing solution was probably high to neutral at the chloritization stage, neutral to slightly low at the argillization stage, and low at the silicification stage. The second cycle may have been similar to the first: the temperature of alteration is inferred to have been at about 400°C. Enargite, luzonite, native gold, native silver, and pyrite are the important ore minerals. R. A. H.

FRANKEL (J. J.). *Uvarovite garnet and South African jade (hydrogrossular) from the Bushveld complex, Transvaal.* Amer. Min., 1959, **44**, 565–591, 8 figs., 2 pls.

Uvarovite is associated with the chromitite seams in the norite body of the Bushveld igneous complex. Ten chemical analyses are given with tables showing sp.gr., optical, and X-ray data for uvarovite. Petrographic studies were made on 10 uvarovite-bearing rocks. Both uvarovite and hydrogrossular have developed within the same zone of the norite body, but uvarovite is associated with the chromitite and pyroxenite, the 'jade' is in the anorthosite. A. C. H.

ANERJEE (A. K.) & BHATTACHARYYA (T. K.). *On the petro-genetic study of some magnetites from west of Kudada, Singhbhum Dt., Bihar.* Quart. Journ. Geol. Min. & Met. Soc. India, 1958, **30**, 1-6, 6 figs.

The origin of magnetite in a mass of ultrabasic rock is attributed to late stage hydrothermal metamorphism of the host rocks. Hematite exsolved from magnetite was later partly oxidized to magnetite and martite by hot hydrothermal solutions.

A. P. S.

URNHAM (C. WAYNE). *Contact metamorphism of magnesian limestones at Crestmore, California.* Bull. Geol. Soc. America, 1959, **70**, 879-920, 6 figs., 10 pls.

The contact-metamorphic rocks at Crestmore, California, occur between magnesian marble and a plutonic mass of quartz-diorite and between the marble and a small pipe-like mass of quartz-monzonite-porphry. The quartz-diorite is contaminated only locally near contacts, whereas the younger quartz-monzonite-porphry is nearly all contaminated by assimilation of marble. The calcisilicate contact zone of the quartz-diorite is generally less than 1 foot thick, whereas the contact zone of the quartz-monzonite-porphry is as much as 50 feet thick and contains the numerous complex mineral assemblages for which Crestmore is famous. Detailed mapping and diamond drilling have disclosed a well-defined zonal distribution of mineral assemblages, which reflect a corresponding zonation in the bulk chemical composition. The zones and their relations are described in detail. Sixteen new chemical and abundant modal analyses are given; also a chemical analysis of prehnite. Contact metamorphism at Crestmore should be viewed as progressive metasomatism with consequent decarbonation at elevated temperatures rather than as progressive decarbonation attendant simply upon rising temperature.

A. L. A.

ARAP (H.). *Studien an den Skarnmineralien der Äsgrube im Eisenerzfeld von Norberg, Mittelschweden.* Geol. Fören. Förh. Stockholm, 1957, **79**, 542-571, 7 figs. (English summary.)

A garnet-pyroxene skarn typical for the Central Swedish iron-ore fields is examined. Optical measurements and chemical analyses establish that the pyroxene from Äsgruvan is a sahlite with a content of 26-45% hedenbergite. The colourless amphibole belongs to the tremolite-actinolite series with a content of 5-32% ferro-tremolite. The distribution of garnet is irregular. According to the author's determination the garnet of the Äsgruvan mine has a content of 66-88% andradite. Epidote crystals are sparse and infrequently show cores of orthite. It may be assumed that the reaction leading to the formation of the skarn took

place under a certain amount of rock pressure and this may have brought about a reduction in the temperature of decarbonization.

E. Å-n

FRIETSCH (R.). *Studier över skarnbildningen i Grythyttfältet.* Geol. Fören. Förh. Stockholm, 1957, **79**, 133-160, 9 figs. (English summary.)

The investigation gives the following picture of skarn formation in associations poor in manganese. Contemporaneously with the recrystallization of the hälleflinta mobilization of the ore occurred and a Mg-rich biotite resulted. Epidote appeared simultaneously with or somewhat later than biotite. Skarn formation in the paragenesis rich in manganese takes place in the following manner. The first formed mineral, biotite, is replaced by spessartine which in turn is replaced by grunerite. The first formed biotite takes up Mg, Fe²⁺, Al, and some Mn. Both spessartine and grunerite are formed at the expense of the biotite.

E. Å-n

LAPHAM (DAVIS M.). *Magnetite in microcrystalline quartz, Lancaster County, Pa.* Amer. Min., 1959, **44**, 672-674, 2 figs.

In a study of the chromites and serpentines of south-eastern Pennsylvania, blebs of magnetite were observed in the silicified contact zone between a serpentinized ultramafic mass and a later quartz pegmatite dike. The formation of the magnetite in the quartz was deduced from X-ray powder data and spectrographic analysis.

A. C. H.

DIETRICH (R. V.). *Banded gneisses.* Journ. Petr., 1960, **1**, 99-120, 5 figs.

In view of the diverse origins of banded gneisses, a genetic classification is proposed. The main division is into three categories: gneisses with relict primary banding; composite mixtures of residual and introduced material; and metamorphically differentiated rock. These categories are each sub-divided and criteria offered for the recognition of the genesis of each type.

G. M. B.

LJUNGREN (P.). *Basic metamorphic rocks from the region of Höljes in northern Vermland. A study in progressive and retrograde metamorphism.* Geol. Fören. Förh. Stockholm, 1958, **80**, 20-54, 12 figs., 19 tables.

The basic rocks from the region of Höljes, in the northern part of Vermland County, are enclosed within quartz porphyry, and consist of amphibolite, hornblendite, and biotite-epidote schists, partly with neo-formed hornblende. Evidence is given that the biotite-epidote schists have arisen from marly sediments by progressive metamorphism, that the amphibolite and the hornblendite have arisen from

basaltic lava and basaltic tuff through retrograde metamorphism, and, finally, that the biotite-epidote schists with neo-formed hornblende are derived from the ordinary biotite-epidote schist through a transformation of biotite and epidote into hornblende in connection with an invasion of sodium from the basaltic rocks on their transformation into amphibolite and hornblendite. Chemical and planimetric analyses are given of four varieties of biotite-epidote schist, of amphibolite, and of epidote-biotite hornblendite. Optical determinations have been carried out on biotite, epidote, and hornblende.

E. W.

ANDERSON (J. G. C.). *The Moinian and Dalradian rocks between Glen Roy and the Monadhliath Mountains, Inverness-shire*. Trans. Roy. Soc. Edinburgh, 1956, **63**, 15-36.

Limestone of the Dalradian System lies on a variable series of pelites and impersistent quartzites which pass downwards into a great thickness of Moine granulites. The rocks have been folded into parallel-limbed folds, often overturned, which trend north-east-south-west. Most formational junctions are stratigraphical but tectonic contacts possibly occur. A well-developed sillimanite zone in the east is separated from the garnet zone, which covers most of the area, by a poorly-developed kyanite zone, and is related to a major migmatite and pegmatite belt. Post-tectonic intrusions of the granite-appinite suite are present and, like the metamorphic rocks, are cut by several important north-east-south-west faults.

G. P. B.

RAST (N.). *Metamorphic history of the Schiehallion complex (Perthshire)*. Trans. Roy. Soc. Edinburgh, 1958, **63**, 413-431.

Textural analysis supports structural observations in demonstrating that three episodes of regional metamorphism have affected the rocks of the complex; a fourth, retrogressive, episode, associated with faulting, occurred locally much later. The third episode, by far the most important, was characterized by metasomatism and the development of staurolite, kyanite, and plagioclase in the meta-sediments and of scapolite in the metamorphosed igneous rocks. Occurring after the structural development of the complex had been essentially completed, it followed a pattern controlled by earlier-formed antiforms and slides. Comparison of the textures produced by the three episodes of regional metamorphism shows the influence of tectonic events on the crystallographic development of minerals.

G. P. B.

HARRY (W. T.). *A re-examination of Barrow's Older Granites in Glen Clova, Angus*. Trans. Roy. Soc. Edinburgh, 1958, **63**, 393-412, 4 figs., 1 pl.

Laboratory and field re-examination has shown that the masses of muscovite-biotite-gneiss mapped by Barrow around Glen Clova are divisible into two groups of distinct petrographic character and age: a group of variably banded quartz-oligoclase-mica gneisses, and a later group of microcline-granite intrusions. The various rock-types of the groups and of the country rocks are described and seven chemical analyses of rocks and two of minerals (almandine garnet and muscovite) are given; numerous modal analyses are also given. The occurrence of sillimanite (fibrolite) replacing mica is described. G. P. B.

PANTIN (H. M.). *The petrology of the Ben Vrackie epidiorites and their contact rocks*. Trans. Geol. Soc. Glasgow, 1956, **22**, 48-79.

In the Dalradian rocks of this part of Perthshire epidiorite sills are important. Petrographically they are divisible into three groups distinguished by the occurrence of (1) iron-poor clinozoisite, (2) garnet, and (3) ferriferous epidote; the rocks of all groups contain sodic plagioclase and hornblende. Optical data for the constituent minerals of the epidiorites and of their contact rocks are given. For epidiorites have been analysed and seven analyses of hornblendes and two partial analyses of garnets separated from these rocks are given. Two contact rocks have been analysed and three analyses of hornblendes and one partial analysis of garnet separated from the contact rocks have been made. From chemical considerations it is concluded that the epidiorites were originally dolerites and it is suggested that on intrusion they locally enriched the contact rocks in ferric iron and possibly also in sodium.

G. P. B.

MICHEL (ROBERT). *Les faciès à glaucophane dans le massif d'Ambin (Alpes Franco-Italiennes)*. C.R. somm. Soc. géol. France, 1957, **7**, 150-152.

The crystalline series of Ambin contains albitic gneiss with phengite and chlorite, underlain by mica schists and albite gneisses both containing glaucophane; the latter is an aluminous variety, gastaldite.

E. J. & A. S.

AUTRAN (ALBERT) & GUITARD (GÉRARD). *Sur la signification de la sillimanite dans les Pyrénées*. C.R. somm. Soc. géol. France, 1957, **7**, 141-143.

Sillimanite is common in the mesozonal metamorphic terrain of the Pyrenees, and is characteristic of the late episode of migmatitization and granitization. It appears at the initial stage of granitization as fibrolite replacing biotite which has become unstable at that stage. In the final conditions of granitization when equilibrium has been re-established it occurs as prisms.

E. J. & A. S.

ART (H. J.). *On the occurrence of chloritoid in the Pyrenees*. Geol. en Mijnbouw, 1959, new ser., **21**, 119–122, 5 figs. Chloritoid occurs in low-grade Carboniferous, Devonian, and Ordovician pelitic slates in random arrangement, associated with sericite, quartz, penninite, tourmaline, phengite, and ore minerals. Its formation is contemporaneous with and partly later than a phase of fracture cleavage which cuts the slaty cleavage. Localities: Spanish Pyrenees, Valle de Arán and Valira valley; French Pyrenees, Salat valley near Couflens. Diameter of the flakes is 0.1–0.3 mm., thickness 0.01–0.04 mm. They show a fine structure with enclosed quartz, graphite, sericite, and ore minerals; α pale olive green, β pale bluish green, γ colourless, 2V γ , small; polysynthetic twinning on (001). X-ray powder data indicate the triclinic polymorph.

L. P.

BI (A. C.). *Petrographical and geological investigations in the Merdaret-Lac Crop region (Belledonne Massif, France)*. Leidse Geol. Mededelingen, 1959, **24**, 181–282, 57 figs., 5 tables, 1 map. (Dutch and French summaries.)

The Belledonne Massif, consisting mainly of older crystalline schists and granites, is divided into an external and an internal zone by a compressed 'median syncline' filled with varying amounts of Permo-Carboniferous and Mesozoic sediments. The distinction between the two zones is shown to be of petrographical importance. The formations distinguished are: 1. The crystalline schists of the external zone, consisting mainly of sericite-chlorite schists with a variable content of albite porphyroblasts. Ilpnomelane occurs rather frequently in these rocks; 2. The crystalline rocks of the internal zone, consisting mainly of granites, amphibolites, and micaschists. The abundance of sphene in the amphibolites might indicate an igneous origin. Cores of clinopyroxene within amphibole crystals and megacrysts of labradorite with complicated twinning are to be considered as igneous relicts alien to the main phase of metamorphism. Orthite, epidote, and stilpnomelane may be present in these rocks; 3. The sediments, mainly conglomerates, sandstones, and pelites. P. C. Z.

ELHAL (J.). *Étude pétrographique d'un complexe de roches vertes dans le Sud-Kasai*. Serv. Géol. Congo Belge, 1958, Bull. 8, fasc. 3, 19 pp., 1 fig., 2 pls.

Detailed descriptions are given of a series of green rocks with plagioclase, epidote, amphibole, chlorite, iron ore, and in one area a diopsidic pyroxene; the results of 21 chemical analyses are listed.

R. A. H.

EN (S.). *Mineralogical trends in the evolution of metamorphic rocks and origin of granites of East Manbhum, India*. Proc. Nat. Inst. Sci. India, 1959, **25A**, 118–138, 3 figs., 2 pls.

Archaean rocks from Manbhum district consisting of migmatites, leptynites, granulites, granite gneisses, and porphyritic granites are described. The pyroxene granulites (equated to basic charnockites of southern India) and leptynites are considered to be metamorphic rocks unaffected by granitization. Migmatitic types, varying in composition from alaskite to kalialaskite, and granodiorite or diorite are attributed to granitization of these rocks, into which a porphyritic granite is intrusive. Chemical compositions of some rocks are presented and the metamorphic transitions discussed.

A. P. S.

PICHAMUTHU (C. S.). *Trap-shotten rock from the Biligiriangann Hills, Mysore State, India*. Nature, 1959, **183**, 483–484, 3 figs.

Friction between charnockite and gneiss has produced a trap-shotten rock containing fragments of charnockite and porphyroclasts of feldspar, quartz, and hypersthene set in a fine brown matrix. The glass-free matrix also contains stellate growths of oligoclase.

M. J. Le B.

ESKOLA (P.). *On the mineral facies of charnockites*. Journ. Madras Univ., 1957, **27**, Centenary number, 101–119.

The mineralogy of charnockitic rocks is discussed with special reference to their evolution, followed by a review of the present status of the granulite facies and charnockites in the light of the recent experimental studies on hydrous systems. The origin of charnockites is briefly discussed in the light of studies made in Finland and of the literature on the charnockite province of India. [M.A. 13–351] A. P. S.

SASTRY (A. V. R.) & ASWATHANARAYANA (U.). *Distribution of radioactivity in the rocks of South India; part III.—Charnockites and associated rocks of Yercaud–Salem area of Madras State*. Journ. Sci. Ind. Res. [India], 1957, **16B**, 99–101.

The petrogenesis of various rocks is discussed in the light of radioactivity measurements.

A. P. S.

READ (H. H.). *Metamorphic geology and reflection on its past, present and future*. Journ. Madras Univ., 1957, **27**, Centenary number, 71–83.

A review of literature and trends of thought on the evolution of metamorphic rocks is followed by the author's concepts on the granite series in space and time. A plea is made for comprehensive geochemical studies on granite complexes using rapid analytical procedures.

A. P. S.

SEKI (Y.). *Glaucophanitic regional metamorphism in the Kanto Mountains, central Japan*. Jap. Journ. Geol. & Geogr., 1958, **29**, 233–258, 10 figs.

From the distribution of such metamorphic minerals as

glaucophane, actinolite, epidote, pumpellyite, lawsonite, and garnet the metamorphic terrain of the Kanto Mountains is divided into six zones representing progressive mineralogical variations. Glaucophane and pumpellyite are confined to lower grade zones; lawsonite occurs in a narrow zone within the glaucophane-bearing area. Chemical analyses are reported for sodium-amphibole (A) from amphibole-chlorite-epidote-albite schist, Huppu, Yorrimati; sodium-amphibole (B) from amphibole-chlorite-epidote-albite schist, Akuwara, Akuwara-mura; actinolite (C) from actinolite-chlorite-quartz-albite-sphene schist, Siroisi, Higasi-chichibu-mura; lawsonite (D) from cherty rock, Umezono, Ogose-mati; pumpellyite (E) from chlorite-pumpellyite-actinolite-quartz-albite schist, Toba, Sinsenmura; and for another actinolite and a pumpellyite and 22 rocks. Analyses (A), (B), and (D) by Y. Seki, (C) by Y. Seki and C. Kato, (E) by S. Yokoyama.

	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	K ₂ O
A	53.09	0.39	3.42	14.41	8.15	0.12	8.14	2.12	6.01	0.21
B	52.86	0.24	11.29	5.61	7.77	1.78	9.96	2.42	6.50	tr.
C	56.06	0.12	2.14	2.22	8.97	0.23	16.11	10.28	1.36	0.00
D	38.81	0.12	32.02	0.21	0.28	tr.	0.16	17.81	0.18	0.21
E	38.09	n.d.	23.53	2.20	2.18	0.50	3.58	22.96	0.48	0.11

	H ₂ O + H ₂ O-	Total	α	β	γ	2V	$c:\gamma$
A	3.28	0.61	99.95	1.661	1.667	1.670	35-47°(-) (24° c: β)
B	2.08	0.08	'100.51'	1.637	1.640	1.650	22°(-)
C	2.42	0.17	100.08	1.626	1.634	1.640	76-80°(-)
D	10.67	0.36	100.83	1.665	1.675	1.686	76-87°
E	6.56	0.21	100.40	1.680	1.684	1.694	38°(+)

R. A. H.

SHIDO (F.). *Notes on rock-forming minerals (9). Hornblende-bearing eclogite from Gongen-yama of Higasi-Akai of the Bessi district, Sikoku.* Journ. Geol. Soc. Japan, 1959, **65**, 701-703.

Hornblende-bearing eclogite occurs in association with ordinary eclogite within a dunite mass at Gongen-yama in the Sanbagawa-Mikabu glaucophanitic metamorphic belt. The hornblende eclogite is composed mainly of garnet (A) of molecular composition $\text{Py}_{38.3}\text{Gr}_{27.4}\text{Alm}_{26.9}\text{And}_{6.6}\text{Sp}_{0.7}$ (α 11.63Å), bluish green hornblende (B), epidote (γ 1.736, 2V 90°), omphacite (C), with lesser amounts of rutile and sphene (analyses by H. Haramura).

	SiO ₂	Al ₂ O ₃	TiO ₂	Fe ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O
A	37.69	22.87	0.08	2.27	17.78	0.35	7.02	12.32	0.10
B	46.59	11.75	0.18	2.46	8.40	0.07	14.27	11.58	2.18
C	50.78	7.24	0.23	2.96	3.35	0.03	11.92	20.12	2.84

	K ₂ O	H ₂ O +	H ₂ O-	P ₂ O ₅	Total	α	γ	2V	$c:\gamma$
A	tr.	tr.	0.08	tr.	100.56	1.770	—	—	—
B	0.29	1.98	0.11	0.05	99.91	1.636	1.663	86°(-)	19°
C	0.06	0.66	0.00	0.02	100.21	1.677	1.705	62°(+)	48°

R. A. H.

SUZUKI (J.). *On some special minerals in the Kamuikotan crystalline schists.* Journ. Min. Soc. Japan, 1958, **3**, 660-673. (Japanese with English summary, *ibid.*, 801-802.)

The regional metamorphic rocks of the Kamuikotan

complex in central Hokkaido consist of siliceous schist, green schists, quartzites, and limestone and are compared with the Franciscan formation of California. Between these rocks and ultrabasic intrusives a series of contact metamorphic schists are developed containing various sodium-rich silicates. The properties of glaucophane, crossite, riebeckite, crocidolite, aegirine-augite, stilpnomelane, piemontite, lawsonite, and pumpellyite from the metasomatized rocks are described.

R. A. H.

SHIDÔ (FUMIKO). *Plutonic and metamorphic rocks of the Nakoso and Iritōno districts in the central Abukuma plateau.* Journ. Fac. Sci., Univ. Tokyo, 1957, sect. **11**, 131-217, 31 figs.

In the Nakoso district the Tabito igneous complex consists of hypersthene-augite-hornblende-gabbros, hornblende-gabbros, biotite-hornblende-diorites, and hornblende-biotite-granodiorites; seven chemical analyses are given. The metamorphic rocks of the area can be divided into four zones representing progressive metamorphism with the characteristic minerals actinolite, blue-green hornblende, brown hornblende, and in the fourth and highest grade orthopyroxene. Five chemical analyses of hornblendes are presented together with optical data, and the existence of a miscibility gap between the actinolites and common hornblendes is argued. The (Na+K) content of the hornblendes increases generally with rising temperature of formation but varies also with the degree of silica saturation of the host rocks and with the composition of the associated plagioclases. Compositions of hornblendes are expressed in terms of constituent molecules, the rules for the calculation of which are given. Chemical analyses are also given for a clinopyroxene from a clinopyroxene-amphibolite and for a green biotite from a biotite schist.

In the Iritōno district a series of low-grade regional metamorphosed basic rocks has been intruded by an igneous complex ranging from hornblende-gabbros, granodiorites and almandine-biotite-granites giving rise to a contact metamorphic aureole in which three zones are recognized. These zones are compared with those of the Nakoso regional metamorphic area and the status of the epidote-amphibolite facies and the formation of cummingtonite are discussed.

R. A. H.

MIYASHIRO (A.). *Regional metamorphism of the Gosaisaka Takanuki district in the central Abukuma plateau.* Journ. Fac. Sci. Univ. Tokyo, 1958, sect. **2**, **11**, 217-272, 16 figs.

Three zones of regional metamorphism are recognised on the basis of the progressive change in calciferous amphibole in response to rising temperature. These zones are characterized by actinolite, blue-green common hornblende

which the axial colour of γ is bluish-green or greenish-blue, and common hornblende without a bluish tinge in which the axial colour of γ is green, yellow-brownish green, or brownish yellow. Three new chemical analyses of hornblendes are given together with their optical properties. The most common rocks of basic composition are chlorite-epidote-actinolite schist, or hornblende-plagioclase schist in the two higher zones, and for pelitic types graphite-chlorite-biotite-quartz schist in the actinolite zone, biotite-plagioclase-quartz schist in the blue-green hornblende zone, and biotite-potassium feldspar-plagioclase-quartz gneiss with some pyralispite or sillimanite in the common hornblende zone. New chemical analyses are given of 4 biotites from pelitic rocks, of a clinopyroxene from a lens in amphibolite, and of 17 rocks of various types in the three zones. The actinolite zone belongs to the actinolite greenschist facies, and the other two zones belong to the amphibolite facies. Thus the actinolite-greenschist grades directly into the amphibolite facies, while the epidote-amphibolite facies is practically lacking. As compared with the Dalradian type of regional metamorphism this central Abukuma type of metamorphism is believed to represent lower solid pressures. [M.A. 12-382]

R. A. H.

ROEVER (W. P. de). *Some additional data on the crystalline schists of the Rumbia and Mendoke Mountains (S.E. Celebes)*. Kon. Ned. Geol.-Mijnbouwk. Genootschap, Geol. Ser., 1956, **16** (Gedenkboek H.A. Brouwer), 385-393, 1 fig.

The schists of the Rumbia and Mendoke Mountains represent sedimentary rocks metamorphosed in the garnet-lawsonite-glaucophane schist subfacies, although locally lawsonite appears to have been unstable and conditions were equivalent to the garnet-epidote-glaucophane subfacies. The sequence, beginning with the lowest grade of metamorphism, appears to be pumpellyite accompanied by colourless to light green fibrous amphibole, crossite contemporaneous with lawsonite and jadeitic and acmitic pyroxenes, glaucophane, chloritoid, and garnet. A transition between the pumpellyite and crossite stages may be characterized by the production of the rare amphibole torendrikite, found in metamorphosed radiolarian cherts. [M.A. 11-200, 475]

R. A. H.

REED (J. J.). *Regional metamorphism in south-east Nelson*. New Zealand Geol. Surv. Bull. (new ser.) **60**, 1958, 1-64, 38 figs.

The field occurrence, structure, and petrography of quartzo-feldspathic schists derived from Palaeozoic grey-wackes and argillites are described. Chlorite, biotite, and garnet zones are recognized; the chlorite zone is divided into three sub-zones—Chl. 1 to 3—analogue with 3 of the 4

established for the chlorite zone in Otago [M.A. 8-19, 20]. Chlorite schists, actinolite schists, and a quartz-stilpnomelane rock derived respectively from volcanic sediments, ultramafic rocks, and iron-rich jasper, are present in minor amount.

Almandine-rich garnet (A) from quartzo-feldspathic schist (quartz-oligoclase-biotite-muscovite-garnet) has n (calc.) 1.814 and sp. gr. 4.16 ± 0.01 . Garnet (B) from a chlorite schist has n (calc.) 1.807 and sp. gr. 3.96 ± 0.01 . Hastingsitic hornblende (C) from a garnetiferous quartzo-feldspathic schist has α 1.6542 , β 1.6656 , γ 1.6730 ± 0.0005 , $2V_{\alpha}$ 77° , $c : \gamma$ 20° , α colourless or pale yellow, β brownish or yellowish green, γ greenish blue, absorption $\gamma > \beta > \alpha$, sp. gr. 3.30 ± 0.01 . Actinolite (D) from actinolite schist has α 1.619 , β 1.630 , γ 1.639 ± 0.001 , $2V_{\alpha}$ $80^{\circ} \pm 2^{\circ}$, $c : \gamma$ $16^{\circ} - 19^{\circ}$, α colourless, $\beta = \gamma$ colourless or very pale green, sp. gr. 2.98 ± 0.01 . Biotite (E) from a quartzo-feldspathic schist (quartz-albite-muscovite-chlorite-epidote-biotite) has α 1.593 , $\beta = \gamma$ 1.660 ± 0.002 , $2V_{\alpha}$ very small, α golden yellow, β medium brown, γ dark brown, absorption $\alpha < \beta < \gamma$, sp. gr. 2.93 ± 0.01 .

The textural and mineralogical changes in the quartzo-feldspathic rocks with increasing metamorphism are described. The rocks are compared and contrasted with schists in other parts of the South Island, and with overseas examples.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MgO	CaO	Na ₂ O	K ₂ O	H ₂ O+	MnO	Total
A	37.52	20.48	1.05	29.64	1.80	5.80	0.02	0.06	0.40	3.00	100.34
B	37.28	21.96	0.96	18.32	0.34	11.44	—	—	nt.f.d.	8.30	100.34
C	41.06	18.56	2.80	14.76	7.08	11.58	1.45	0.68	2.14	0.13	100.25
D	58.02	1.25	0.41	4.91	20.51	11.80	0.15	0.02	2.30	0.21	100.21
E	33.12	20.36	7.45	15.52	9.53	0.78	0.44	4.57	6.98	0.27	100.00

Analyses include: (A) H₂O—nt.f.d., TiO₂ 0.57; (B) ign. loss 0.30, TiO₂ 1.44; (C) H₂O—0.25, TiO₂ 1.59, Cr₂O₃ 0.03, SrO tr., F 0.14, total corrected for F 100.19 [(C) is recalcd. to allow for admixed apatite]; (D) H₂O—0.08, TiO₂ 0.04, Cr₂O₃ 0.26, NiO 0.25, S tr., Cl tr. ?; (E) TiO₂ 0.98.

W. A. W.

SEARLE (E. J.). *Schistose rocks from St. Helier's bay, Auckland*. New Zealand Journ. Geol. Geophys., 1959, **2**, 368-379, 8 figs.

Epidote amphibolites found as blocks in the tuff of the St. Helier's bay volcano and at Taylor's hill, Auckland, are described. Brief mineralogical data are given for hornblende, actinolite, tremolite, epidote, augite, and prehnite. The amphibolites are thought to be due to retrogressive metamorphism of a gabbroid rock intruding the underlying basement.

W. A. W.

RÜE (EDGAR A. DE LA). *Quelques observations sur le socle cristallin de l'Amazonie brésilienne*. C.R. somm. Soc. géol. France, 1957, **7**, 204-207.

The presence of granites, gneisses, schists, migmatites, and charnockites in the crystalline basement is reported.

E. J. & A. S.

BARBOSA (RITA ALVES). *Estudo de alguns charnockitos de Estado do Rio. Divn. Geol. e Min., Dept. Nac. Prod. Mineral., 1959, Bol. 192, 31 pp., 20 figs., 10 pls.*

Petrographic descriptions of microsections of some charnockites of the state of Rio are given with modal composition. A. B. R.

WAHLSTROM (ERNEST E.) & KIM (OK JOON). *Precambrian rocks of the Hall Valley area, Front Range, Colorado. Bull. Geol. Soc. America, 1959, 70, 1217-1244, 18 figs., 4 pls.*

The Hall Valley area, in north-western Park County, Colorado, contains Precambrian foliated high-grade metamorphic rocks resulting from recrystallization of a complexly folded and faulted clastic sedimentary sequence, which consists of two series of strata separated by an angular unconformity of regional extent. Some of the metamorphic rocks were further modified by migmatization and granitization, which seem to have followed an interval of extensive faulting and dislocation of the previously metamorphosed rocks. Outside the areas of extensive migmatization and granitization the field relations and chemical composition indicate the fabric, composition, and probable manner of deposition of the original sediments for which ten chemical analyses with approximate modes are given. Seven chemical analyses and measured modes are given of migmatites and granitic rocks. Joint, lineation, and petrofabric diagrams are presented and the chronology of petrologic and structural events is discussed. A. L. A.

BUDDING (A. J.). *Regional metamorphism of Precambrian rocks in a part of central Saskatchewan, Canada. Kon. Ned. Geol.-Mijnbouwk. Genootschap, Geol. Ser., 1956, 16 (Gedenkboek H.A. Brouwer), 37-41, 1 fig.*

A geosynclinal sequence of clastic sediments and volcanic extrusives has been intensely folded and invaded by granitoid rocks of varying composition. The regionally metamorphosed rocks range from low grade phyllites and greenstones to high grade garnet-biotite gneisses, amphibolites, and hornblende gneisses. Concordant granitic bodies are for the most part syntectonic. R. A. H.

LJUNGGREN (P.). *Granitic rocks of the crystalline core of the Antillean Cordillera, central Guatemala. Geol. Fören. Förh. Stockholm, 1959, 81, 467-477, 2 figs.*

Field examination within the region of Rabinal and Salamá in Central Guatemala has shown that large areas of the crystalline core of the Antillean Cordillera consist of albite gneisses. Within these rocks there exist isolated areas of microcline-plagioclase granites. Microscopic examination and planimetric analyses of the different rocks

give evidence that the granite originated by potash metasomatism of plagioclase-dominated gneissic rocks. It is concluded that the albite gneisses developed by sodium metasomatism of phyllites and mica schists, and the granite by potash metasomatism of parts of the albite gneisses. The modes of transformation, the relationship between feldspathizations within the deeper parts of geosynclines, and the zonal distribution of ore deposits are discussed. E. W.

Petrology : Vulcanology

GÈZE (BERNARD). *Réflexions sur les ignimbrites et les laves acides. C.R. somm. Soc. géol. France, 1957, 7, 348-351.* E. J. & A. S.

GRANGEON (PIERRE) & MICHEL (ROBERT). *Bombes volcaniques intraformationnelles dans les péperites de la Montagne d'Andance (Massif du Coiron, Ardèche). C.R. Acad. Sci. Paris, 1957, 244, 2627-2629.*

Petrographical examination indicates that the peperites are the product of crumbled basanitoid material intruded into the diatomaceous muds which have filled the lake in the Upper Miocene. Bombs projected only a short distance from the volcanic centre have been found at the base of the peperite series; they have been formed during the sublacustrine eruption. The name intraformational is proposed by the authors for such bombs. E. J. & A. S.

RUTTEN (M. G.). *Ignimbrites or fluidised tuff flows on some mid-Italian volcanoes. Geol. en Mijnbouw, 1959, new ser., 21, 396-399, 1 fig.*

The Vulsini, Vico, and Sabatini volcanoes, which are situated north of Rome, display low broad cones, formed by massive tuffs and tuff-breccias. From field evidence these products, of which the massive tuff-breccias occupy a volume of 10 km³, are interpreted as ignimbrites or tuff flows. Because of the lithological and topographical differences between ignimbrites and normal, subaerial tuffs, most of the material of these three Quaternary volcanoes is thought to have been erupted through a fluidization process. C. J. O.

GÈZE (BERNARD), HUDELEY (HENRI), VINCENT (PIERRE) & WACRENIER (PHILIPPE). *Morphologie et dynamisme des grands volcans du Tibesti (Sahara du Tchad). C.R. somm. Soc. géol. France, 1957, 7, 117.*

E. J. & A. S.

GÈZE (BERNARD), HUDELEY (HENRI), VINCENT (PIERRE) & WACRENIER (PHILIPPE). *Le volcan du Toussidé, dans le Tibesti occidental (Sahara du Tchad, A.E.F.). C.R. Acad. Sci. Paris, 1957, 245, 1815-1818.*

The top of the once great rhyolitic and trachytic pile of Pré-Toussidé has given place to a caldera of collapse connected with a rich emission of ignimbrites. Later, on the edge of the caldera two important explosion craters appeared, and lastly the cone of Toussidé itself. Of other small basaltic puy's which stud the area, some are earlier, some later than the explosions.

E. J. & A. S.

MAÏZE (BERNARD) & VINCENT (PIERRE). *Les volcans du Tarso Yéga, du Tarso Toon, du Tarso Voon et de Soborom, dans le Tibesti Central (Sahara du Tchad, A.E.F.)*. C.R. Acad. Sci. Paris, 1957, **245**, 1938-1940.

Tarso Yéga, Tarso Toon, and Tarso Voon are three large complex edifices—basalto-andesitic, trachytic, and rhyolitic—within which ignimbrites also have considerable importance. The summits are replaced by calderas of collapse; that of Tarso Voon, the most recent, is bordered by the volcano-tectonic dome of Soborom where strong fumarolic activity persists.

E. J. & A. S.

MAZIEFF (H.). *L'éruption du volcan Gituro (Kivu, Congo Belge) de mars à juillet 1948*. Serv. Géol. Congo Belge, 1951, mem. 1, 158 pp., 31 figs., 22 pls.

A detailed and complete account is given of the eruption of Gituro (29° E., 1°30' S.) including descriptions of the development of cinder cones. The leucite-basanite lava emitted is considered to be due to the contamination of basaltic magma by calcium-magnesium rocks of the substratum. Six chemical analyses of the kivitites are given and the memoir is illustrated by many photographs of volcanic activity.

R. A. H.

MAÏNE (G.). *Resultats des quatres missions effectuées au volcan Nyamuragira en vue de recoller et d'analyser les gaz et les sublimes*. Serv. Géol. Congo Belge, 1958, Bull. 8, fasc. 4, 20 pp., 3 figs., 2 pls.

The methods used for collecting and analysing the fumarole gases from the Nyamuragira volcano during the solfataric stage are described and the results listed. In the caldera the gases were essentially H₂O and CO₂ with H₂S, SO₂, and SO₃ as accessories, while at Shabubembe, a thermal spring on the side of the volcano, the gases were essentially air with some B and F. Analyses of the sublimes show that in the caldera they were composed of sulphur, sulphates, and ammonium chloride, and that at Shabubembe they were essentially sodium and potassium chlorides.

R. A. H.

BOULANGER (JACQUES). *Le système volcanique fissural du pays Mahafaly (SW de Madagascar)*. Bull. Soc. géol. France, 1957, **7**, 529-537.

A swarm of nearly 500 parallel dykes trending N. 60°W.

is found in this region. Microscopical study shows that the rocks of the dykes represent an extreme magmatic differentiation ranging from rhyolitic to ultrabasic. Their age is probably post-Karoo. Six analyses are quoted from papers by A. Lacroix.

E. J. & A. S.

MACDONALD (G. A.). *The structure of Hawaiian volcanoes*. Kon. Ned. Geol.-Mijnbouw. Genootschap, Geol. Ser., 1956, **16** (Gedenkboek H.A. Brouwer), 274-295, 2 figs., 1 pl.

The Hawaiian shield volcanoes consist of broad constructional domes commonly with collapse calderas at their summits. Rift zones extend radially from the summit, marked at the surface by open fissures, cinder and spatter cones, and pit craters, and at depth by hundreds of thin nearly vertical dykes. Movement on the rift zones has been almost entirely lateral distension, totalling several thousand metres. The stress pattern appears to be one of upthrust with resultant tensional spreading of the surface about many individual centres.

R. A. H.

CORWIN (GILBERT) & FOSTER (HELEN L.). *The 1957 explosive eruption on Iwo Jima, Volcano Islands [Japan]*. Amer. Journ. Sci., 1959, **257**, 161-171.

A steam explosion on 28 March, 1957, produced no juvenile ejecta, and only a maximum thickness of 22 feet of volcanic sand and sandstone and conglomerate. During the following five days, the steam steadily diminished, leaving thin coatings of unidentified white sublimate about the vents. Nearly all of the activity died out before 2 April. The explosion was caused by a subsurface accumulation of steam in recent fill in this area. A collapse crater formed 110 feet northwest of the explosion pit, and a number of new fissures and faults formed within an area extending 500 feet southwest and west, and in an area extending about 300 feet just south of east.

H. W.

AVIAS (JACQUES). *Note sur les sources thermales de Nouvelle-Calédonie*. Proc. 7th Pacific Sci. Congr. (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 482-484, 4 figs.

The best known thermal springs in New Caledonia are found in the Crouen Valley, near the north-east coast. They are generally sulphurous and are closely associated with serpentinites, peridotites, or the sedimentary rocks surrounding them. They are considered to be the final signs of activity connected with the formation of the ultramafic bodies.

W. A. W.

WESTERVELD (J.). *Eruptions of acid pumice tuffs and related phenomena along the great Sumatran fault-trough system*. Proc. 7th Pacific Sci. Congr. (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 411-438, 12 figs.

The distribution and characteristics of acid pumice tuffs, including ignimbrites, erupted from fissures during the early Quaternary are described. These were accompanied by minor basalts and andesitic rocks. Later eruptions in south Sumatra comprise tuffs and rhyolitic to dacitic lavas. The geological and tectonic setting of the volcanic rocks is described and their petrochemistry discussed. The geological history and petrochemistry of the Krakatau volcanic islands are described. Many references to earlier work on the volcanic rocks of Sumatra are given. W. A. W.

REILLY (W. I.). *Temperature distribution about a cooling volcanic intrusion*. New Zealand Journ. Geol. Geophys., 1958, **1**, 364–374, 5 figs.

Temperature distributions are derived for the conductive transfer of heat from a vertical volcanic feeding dyke or pipe of radius a , injected into a rock mass of thermal diffusivity X which has an initial steady-state temperature distribution due to an underlying magmatic layer of constant temperature at depth h . The temperature at a distance x from the centre of the intrusion and a depth z below the surface is found when the dyke or pipe has cooled for time t after injection. Results are expressed in terms of the parameters $\xi = x/h$, $\alpha = a/h$, $\zeta = z/h$, and $\tau = \sqrt{Xt}/h$; and numerical results, including graphs of the surface thermal gradient and of the temperature at the centre of the dyke or pipe, are given for $\alpha = 0.01$, $0 \leq \xi \leq 0.30$, $0.01 \leq \zeta \leq 0.80$, and $0.001 \leq \tau \leq 0.050$. W. A. W.

WHITE (DONALD E.), SANDBERG (C. H.), & BRANNOCK (W. W.). *Geochemical and geophysical approaches to the problems of utilization of hot spring water and heat*. Proc. 7th Pacific Sci. Congr. (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 490–499.

The paper includes analyses of hot spring waters of meteoric origin from Warm Springs, Georgia, and Steamboat Springs, Nevada, and of thermal waters of volcanic origin from several localities. W. A. W.

COLLINS (B. W.). *Thermal waters of Banks Peninsula, Canterbury, New Zealand*. Proc. 7th Pacific Sci. Congr. (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 469–481, 2 figs.

Warm springs associated with late volcanic activity near Lyttelton, on the north-west part of Banks Peninsula, are described. An analysis of the spring water from Ferry-meade, Heathcote Valley, gives (in p.p.m.) SiO_2 44.3, Al^{3+} tr., Ca^{2+} 21.4, Mg^{2+} 8.7, Cl^- 170.4, SO_4^{2-} 17.5, total solids 450. The spring at Rapaki shows 2840 p.p.m. Cl^- . Thermal springs from other parts of the South Island are briefly described. Apart from a doubtful report from Timaru, on the east coast, all are found in the greywacke

and schist highland axis. Several are undoubtedly connected with [active] faults, and the waters of all are thought to be of meteoric origin. W. A. W.

WILSON (STUART H.). *The chemical investigation of the hot springs of the New Zealand thermal region*. Proc. 7th Pacific Sci. Congr. (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 449–469, 6 figs.

Representative analyses of hot-spring waters, and gases from bubbling pools, from several localities in the thermal region of the North Island are given. Condensates and gases from fumaroles and steam vents have also been analysed. Analyses of the gases absorbed in volcanic ash on White Island, Bay of Plenty, and Ngauruhoe volcanoes are believed to give an indication of the original composition of the volcanic gases. Methods of collection of the waters, gases, and condensates are described and figured. Various theories of hot spring development are discussed [See following abstract] W. A. W.

LLOYD (E. F.). *The hot springs and hydrothermal eruptions of Waiotapu [New Zealand]*. New Zealand Journ. Geol. Geophys., 1959, **2**, 141–176, 15 figs.

Four groups of hot spring waters are recognised: (1) acid sulphate waters (pH 2 to 5), with little or no chloride. Acidification is due to superficial oxidation of H_2S ; (2) sulphate-chloride waters (pH 2.5), with about 200 p.p.m. Cl^- ; (3) chloride waters (pH 6 to 8.5), with up to 180 p.p.m. Cl^- and small amounts of bicarbonate and sulphates; and (4) bicarbonate-chloride waters, with about 500 p.p.m. bicarbonate and up to 1800 p.p.m. Cl^- . Up to 9 p.p.m. F^- are present in most of the waters; some springs also have up to 110 p.p.m. HBO_2 . Steam-blast type eruptions, dated by radio-carbon evidence to a period about 900 years ago, have left many small craters. The eruptions are classed as hydrothermal, because only hydrothermally altered country rock was ejected. The association of present thermal activity with craters formed during the outburst, the effects of the volcanicity on the hydrothermal system, and possible mechanisms for the eruptions are discussed. W. A. W.

[VLODAVETZ (V. I.), editor]. Влодавец (В. И.) редактор Каталог действующих вулканов СССР [Catalogue of the active volcanoes of the U.S.S.R.]. Бюлл. Вулкан. Станции, Акад. Наук СССР [Bull. Volc. Stn., Acad. Sci. U.S.S.R.], 1957, no. 25, 3–178, 114 figs.

This volume consists of a preface (pp. 3–4) and two articles:

[Vlodavetz (V. I.) & Piip (B. I.) Влодавец (В. И.) и Пийп (Б. И.). Каталог действующих вулканов Камчатки [Catalogue of the active volcanoes of Kamchatka], pp. 5–95, 49 figs., and

Gorshkov (G. S.) Горшков (Г. С.). Каталог действующих вулканов Курильских островов. [*Catalogue of the active volcanoes of the Kurile Islands*], pp. 96–178, 65 figs.

Sixty-seven active volcanoes are catalogued: 28 on Kamchatka, and 39 on the Kurile Islands. For each volcano the following particulars are given: name and synonyms, situation, height, form, geological setting (tectonics, structure, age), crater, lava flows, composition of volcanic products (mineralogical and chemical composition of pyroclasts, lavas, and fumarolic minerals and deposits), dates of eruptions, type of eruption, particulars of volcanic activity, eruption forecasts, bibliography. The text is supported by numerous photographs and maps. A large number of chemical analyses of lavas and fumarole products are given. [M.A. 11–35, 13–387 to 391] S. I. T.

Piip (B. I.), editor] Пийп (Б. И.), редактор. Молодой вулканизм СССР [*The young volcanism of the U.S.S.R.*]. Труды Лабор. Вулканологии, Акад. Наук СССР. [*Trans. Labor. Volc., Acad. Sci. U.S.S.R.*] 1958, no. 13, 3–254, 85 figs.

This volume contains fourteen articles, which are as follows:

Gorshkov (G. S.) Горшков (Г. С.). Действующие вулканы Курильской островной дуги [*The active volcanoes of the Kurile Islands Arc*], 5–70, 36 figs.

Bezrukov (P. L.), Zenkevich (N. L.), Kanaev (V. F.), & Udintsev (G. B.) Безруков (П. Л.), Зенкевич (Н. Л.), Канаев (В. Ф.) и Удинцев (Г. Б.). Подводные горы и вулканы Курильской островной дуги [*The submarine mountains and volcanoes of the Kurile Islands Arc*], 71–88, 4 figs.

Svyatlovsky (A. E.) Святловский (А. Е.). Новейшие движения земной оболочки и вулканизм в районе Курило-Камчатской островной гряды [*The modern movements of the earth's crust and volcanicity in the region of the Kurile-Kamchatka Islands Arc*], 89–98, 2 figs.

Piip (B. I.) Пийп (Б. И.). Особенности извержений Ключевской сопки. [*The peculiarities of the Klyuchevskoy volcano eruptions*], 99–119, 18 figs.

Navoko (S. I.) Набоко (С. И.). Изменение пород в зонах активного вулканизма. [*The alteration of rocks in the zones of active volcanicity*], 120–136, 8 figs.

Vlodavets (V. I.) Влодавец (В. И.). Рассеянные элементы в вулканических продуктах. [*The scattered elements in volcanic products*], 137–154.

Basharina (L. A.) Башарина (Л. А.). Фумарольные газы вулканов Ключевского и Шивелуча [*Fumarole gases of the Klyuchevskoy and Sheveluch volcanoes*], 155–159.

Florensky (K. P.) Флоренский (К. П.). К вопросу об изучении вулканических газов. [*On the problem of the investigation of volcanic gases*], 160–165.

Vlasov (G. M.) Власов (Г. М.). Вулканические отложения серы и некоторые вопросы близповерхностного рудообразования. [*The volcanic sulphur deposits and some problems of the subsurface ore formation*], 166–178.

Knitavov (N. I.) Хитаров (Н. И.). Задачи исследований в районах современного вулканизма в связи с вопросами глубинного рудообразования. [*The problems of investigation in modern volcanic regions in connection with the problems of deep ore formation*], 179–185, 2 figs.

Ivanov (V. V.) Иванов (В. В.). Основные закономерности формирования и распространения термальных вод Камчатки. [*The principal regularities of the formation and spreading of the Kamchatka thermal springs*], 186–211, 2 figs.

Ustiev (E. K.) Устиев (Е. К.). Позднечетвертичный вулканизм Южно-Ануйского хребта и Восточно-Азиатская вулканическая провинция. [*The late-Quaternary volcanicity of the South-Anuy range and the East Asia volcanic province*], 212–232, 7 figs.

Favorskaya (M. A.) Фаворская (М. А.). Некоторые особенности развития молодого вулканизма Сихотэ-Алиня. [*Some peculiarities of the development of the young volcanicity of Sikhote-Alin*], 233–242, 4 figs.

Sobolev (V. S.) & Kostyuk (V. P.) Соболев (В. С.) и Костюк (В. П.). К геологии неогеновых вулканических пород Закарпатья. [*On the geology of the Transcarpathian Neogene volcanic rocks*], 243–254, 2 figs.

S. I. T.

Gorshkov (G. S.) Горшков (Г. С.). Некоторые вопросы теории вулканологии. [*Certain problems in the theory of volcanology*]. Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Geol. Ser.], 1958, no. 11, 21–27, 2 figs.

In a previous publication [M.A. 13–390] the author has suggested that on the basis of the screening effect of transverse seismic waves, it is possible to estimate the depth of the 'hearth' of the Klyuchevsky volcano, Kamchatka, as of the order of 60 km. More detailed calculations show that the form of the 'hearth' is that of a flat triaxial ellipsoid, 25–35 km in size and $1 \text{ to } 2 \times 10^4 \text{ km}^3$ in volume. The calculated elastic constants show that at the depth of 60 km, that is, in the upper zone of the mantle, the conditions are most favourable for the transition of solid matter into a liquid on change of thermodynamic conditions.

S. I. T.

Marenina (T. Yu.) Маренина (Т. Ю.). Вулкан Дзензур. [*Dzenzur volcano*]. Бюлл. Вулкан. Станции, Акад. Наук СССР [Bull. Volc. Stn., Acad. Sci. U.S.S.R.], 1957, no. 26, 86–100, 6 figs.

Dzenzur volcano is situated on the eastern border of Kamchatka to the north-west of Zhupanov volcano. The

majority of the lavas are andesites, but a few are liparitic dacites. Petrographical description of lavas and pyroclastics and also of the fumaroles and altered lavas is given. Two analyses of andesites and one of fumarolic hot water are presented.

S. I. T.

[BASHARINA (L. A.)] Башарина (Л. А.). Водные вытяжки пепла и газы пепловой тучи вулкана Безымянного [*Water extracts of ash and gases of the Bezymnyany volcano ash cloud*]. Бюлл. Вулкан. Станции, Акад. Наук СССР [Bull. Volc. Stn., Acad. Sci. U.S.S.R.], 1958, no. 27, 38-42.

Analyses of ten water extracts from volcanic ash in terms of anions and cations as well as the analyses of gases of an ash cloud from Bezymnyany volcano in Kamchatka are given. In both cases chloride, sulphate, and carbonate radicles have been recorded.

S. I. T.

[НАВОКО (S. I.)] Набоко (С. И.). Об образовании озерной серы на вулкане Головинина. [*On the formation of lake-sulphur on Golovin volcano*]. Бюлл. Вулкан. Станции, Акад. Наук СССР [Bull. Volc. Stn., Acad. Sci. U.S.S.R.], 1958, no. 27, 43-50, 7 figs.

Sulphur scum and shore deposit of a crater lake in Kunashir island in the Kurile group are described; analysis of sulphur sand is given, and also analyses of gases and water.

S. I. T.

[SHAVROVA (N. N.)] Шаврова (Н. Н.). Содержание радия и тория в лавах вулканов Семьячинской группы [*Radium and thorium content of lavas of the Semyachinsk volcano group*]. Бюлл. Вулкан. Станции, Акад. Наук СССР [Bull. Volc. Stn., Acad. Sci. U.S.S.R.], 1958, no. 27, 51-55.

Lavas studied and analysed included three of basalt, two of andesite, two of dacite, and one of rhyodacite. The lavas came from a group of volcanoes in Kamchatka. The amounts of radium varied from 0.20 to 0.45×10^{-12} , thorium from 1.2 to 1.73×10^{-6} and uranium from 0.6 to 1.35×10^{-6} g/g.

S. I. T.

[VLODAVETS (V. I.)] Влодавец (В. И.). Вулканы и вулканические образования Семьячинского района [*Volcanoes and volcanic formations of the Semyachinsk region*]. Труды Лабор. Вулканологии, Акад. Наук СССР [Trans. Labor. Volc., Acad. Sci. U.S.S.R.], 1958, no. 15, 3-195, 85 figs.

Volcanoes of the region Bolshoi Semyachinsk and Maliy Semyachinsk in Kamchatka are described. This region contains a large number of extinct and two active volcanoes. Various cones, domes, pyroclasts, and lavas are described. Of particular interest are the tuffolavas and the tuffo-

breccias, mud volcanoes and mud flows, and solfataras. The lavas are basalt, andesite-basalt, andesite-dacite, rhyolite-dacite, and dacite; petrographical description and a number of chemical analyses of these are given. Fumaroles and metasomatic products, and hot springs are also described.

S. I. T.

[VLODAVETS (V. I.)]. Влодавец (В. И.). О происхождении пород, обычно называемых туфолавами и игнимбритами [*On the origin of rocks, usually called tuff-lavas and ignimbrites*]. Туфолавы [tuff-lavas]. Труды Лабор. Вулканологии, Акад. Наук СССР [Trans. Labor. Volc., Acad. Sci. U.S.S.R.], 1957, no. 14, 3-16, 8 figs.

The author compares Semyachinskian (Kamchatka) tuff-lavas to ignimbrites and piperno and suggests a novel origin involving an intermixture of rhyodacitic and dacitic magmas resulting in a dacitic groundmass with lenticular fragments of rhyodacite.

N. R.

[PETROV (V. P.)]. Петров (В. П.). Игнимбиты и туфовые лавы; еще о природе Арктик-туфа [*Ignimbrites and tuff-lavas; once more on the nature of Arctic tuff*]. Туфолавы [Tuff-lavas]. Труды Лабор. Вулканологии, Акад. Наук СССР [Trans. Labor. Volc., Acad. Sci. U.S.S.R.], 1957, no. 14, 17-25, 2 figs.

Certain Quaternary Armenian acid pyroclastic rocks are reviewed and two types are recognized, namely the Arctic tuff and the Erevan tuff. The former is interpreted as a tuff-lava. It grades downwards into typical lava and is supposed to have originated by vesiculation on the top of genuine lava flow. The Erevan variety is accepted as welded tuff.

N. R.

[FAVORSKAYA (M. A.)]. Фаворская (М. А.). К вопросу о механизме образования некоторых туфолав [*On the mechanism of formation of certain tuff-lavas*]. Туфолавы [Tuff-lavas]. Труды Лабор. Вулканологии, Акад. Наук СССР [Trans. Labor. Volc., Acad. Sci. U.S.S.R.], 1957, no. 14, 26-35, 7 figs.

Details of the Eocene tuff-lavas in the Oliginsk region, S.W. Siberia are described. The presence of liparite domes and necks with streaky structure, which is characteristic of tuff-lavas, leads the author to suggest that many tuff-lavas are not welded-tuffs. The liparite domes are associated with lines of tectonic activity.

N. R.

[VOLOVIKOVA (I. M.)]. Воловикова (И. М.). Игнимбиты Кураминского хребта (Северный Тянь-Шань) [*Ignimbrites of the Kuraminsk Range (Northern Tian-Shan)*]. Туфолавы [Tuff-lavas]. Труды Лабор. Вулканологии, Акад. Наук СССР [Trans. Labor. Volc., Acad. Sci. U.S.S.R.], 1957, no. 14, 36-47, 10 figs.

The Upper Palaeozoic ignimbrites of the Kuraminsk Range (S.E. of Tashkent) have been investigated. In particular, the flattening of the pumice fragments towards the bottom of the sheets is confirmed with the aid of thin sections. Detailed description of field relationships, petrography, and mineralogy is supplemented by chemical analyses.

N. R.

РЫБАЛОВ (B. L.). Рыбалов (B. Л.). О происхождении некоторых туфолов юго-западных отрогов Северного Тянь-Шаня [*On the origin of certain tuff-lavas of the south-western spurs of Northern Tian-Shan*]. Туфолавы [Tuff-lavas]. Труды Лабор. Вулканологии, Акад. Наук СССР [Trans. Labor. Volc., Acad. Sci. U.S.S.R.], 1957, no. 14, 48–67, 11 figs.

An Upper Carboniferous volcanic complex in the Tian-Shan mountains is envisaged as a central type volcano. Tuff-lavas here form feeder dykes as well as extrusive sheets. The author describes the hand-specimen characters as well as field relations, and concludes that these rocks are a mixture of pyroclastic material and lava.

N. R.

BYERS (F. M., Jr.) & BARTH (T. F. W.). *Volcanic activity on Akun and Akutan Islands [Aleutians]*. Proc. 7th Pacific Sci. Congr. (Auckland and Christchurch meeting), 1953 (for 1949), 2, 382–397, 9 figs.

The history of volcanic activity is outlined. Akun is now extinct, historic solfataric activity having ceased between 1942 and 1945. An analysis of fissure-filling material produced by this activity is given; the minerals present are pyrite, limonite, sulphur, alunite, dickite, aragonite, and chalcedony.

Akutan is still vigorously active, giving major pyroclastic eruptions and extrusions of basalt flows. An analysis of hot spring water (pH 6.9–7.0) from the island gives (in p.p.m.) F^- 0.7, Cl^- 350, SO_4^{2-} 39, HCO_3^{2-} 192, $B_2O_3^{2-}$ 36, K^+ 21, Na^+ 288, Ca^{2+} 9.9, Mg^{2+} 1.4, SiO_2 128; total dissolved solids at 180°C 952 p.p.m.

W. A. W.

KIMURA (KENJIRO). *On the utilization of hot springs in Japan*. Proc. 7th Pacific Sci. Congr. (Auckland and Christchurch meeting), 1953 (for 1949), 2, 500–504.

Two analyses of hot spring waters at Arima are given. A brief description is given of the recovery of various elements—including lithium, rubidium, and caesium—from these springs during the last war. Natural gas is utilized, and iodine and bromine have been extracted from the mineral waters of Mohara, Chiba Prefecture. Flow sheets illustrating the extraction processes are given.

W. A. W.

KIMURA (KENJIRO). *Geochemical studies on the radioactive springs in Japan*. Proc. 7th Pacific Sci. Congr. (Auckland and Christchurch meeting), 1953 (for 1949) 2, 485–489.

Two springs at Masutomi contain 12000 and about 5000 Mache units respectively of radon. In the Misasa hot spring region one spring shows about 450 Mache units of thoron. Other springs containing appreciable amounts of polonium, thorium X, actinium, and other radioactive components are briefly described and tabulated.

W. A. W.

Petrology : petrogenesis

GAGNY (C.). *Le rôle du pyroxène dans l'histoire de la cristallisation du granite à biotite et amphibole des Crêtes (Vosges)*. Bull. Soc. franç. Min. Crist., 1958, 81, 110–111, 3 figs.

A granite, originally containing clinopyroxene, amphibole, and biotite, has been converted by the recrystallisation in situ of its clinopyroxene into an amphibole-biotite granite.

R. A. H.

PERRIN (RENE). *Granites eutectiques ou métamorphiques ? Discussion d'études récentes*. Bull. Soc. géol. France, 1957, 7, 91–114.

N. L. Bowen and Schairer, following their studies on the equilibrium diagrams of crystallizing melts, concluded that the crystallization of natural magmas must result in a residual eutectic liquid of granitic composition. Tuttle and Chayes affirm that natural granites have a composition close to this eutectic. The author gives reasons to show that a study of these authors' work does not allow the conclusion that granites have derived from the differentiation of a basaltic magma.

E. J. & A. S.

SÆTHER (EGIL). *The alkaline rock province of the Fen area in Southern Norway*. Det. Kgl. Norske Vidensk. Selsk. Skr., 1957, no. 1 (Trondheim), 150 pp., 37 figs., 2 pls.

The aim of this comprehensive paper is to present a new interpretation of the genesis of the peculiar rock association of the Fen area, a small area surrounded by Archaean gneisses just E. of the town of Ulefoss in S.E. Norway. The conclusions are based on a new geological mapping of the area, a number of drillings, a geomagnetic map, and microscopic and spectrochemical examination of a large number of rock specimens. The interpretation differs in important respects from those given by W. C. Brøgger [M.A. 2–165] and N. L. Bowen [M.A. 3–192, 378] and also from the views of H. von Eckermann on the similar Alnö rock province in Sweden [M.A. 11–28]. The main rock types, arranged according to decreasing age, are the following: 1, breccia containing gneiss fragments, indicating an explosive start of the eruptions; 2, fenite formed in situ from gneiss by alkali metasomatism at about 700°C; 3, a group of ultrabasic silicate rocks (vipeitoite, melteigite, ijolite, urtite, pyroxene-søvite, etc., some rich in nepheline, others in

calcite, all truly magmatic) not sharply divided from each other; the magma must have been rich in CO_2 and alkalies, which have also caused the fenitization of the gneiss: 4, *sevite*, consisting of calcite with varying amounts of minor constituents including koppite and columbite, regarded as a peri-magmatic hydrothermal product of the magma just mentioned, intruded into its present positions by plastic flow in the crystalline state: 5, *damtjernite*, a basic igneous rock which carries phenocrysts of biotite: 6, *rauhaugite*, essentially an ankerite rock: 7, *rødberg* (red rock), essentially a calcite rock with finely dispersed haematite. Both *rauhaugite* and *rødberg* must be regarded as products of hydrothermal carbonate solutions originating from the *damtjernite* magma. The *damtjernite*, *rauhaugite*, and *rødberg* represent a rejuvenation of the magmatic activity in the area. It is inferred that the rock province of the Fen area developed from a deep-seated kimberlitic parent magma carrying CO_2 .

I. W. O.

WAGER (L. R.), BROWN (G. M.), & WADSWORTH (W. J.).

Types of igneous cumulates. Journ. Petr., 1960, **1**, 73-85, 5 figs.

The term 'cumulate' is proposed as a group name for igneous rocks formed by crystal accumulation. Such a name, with prefixes according to the accumulated mineral assemblage (e.g., *labradorite-olivine cumulate*) would aid description of contrasted rocks in rhythmically layered intrusions, where names like *troctolite*, *anorthosite*, and *norite* would otherwise be used. After accumulation of the crystal precipitate, various ways of completing the crystallization process lead to differences in the final rock. Thus a plagioclase cumulate may be either poikilitically enclosed by a lower temperature mineral assemblage (an *orthocumulate*) or end up as a pure, unzoned-plagioclase rock (an *adcumulate*). Five such types of cumulate are described and related to varying conditions of accumulation and later growth of crystals in a magma chamber.

R. A. H.

TILLEY (C. E.). *Differentiation of Hawaiian basalts: some variants in lava suites of dated Kilauean eruptions.* Journ. Petr., 1960, **1**, 47-55, 5 figs.

A discussion of the trend of fractionation exhibited by analysed basaltic lavas of three dated Kilauea eruptions: the suite of 1921 in Kilauea Caldera and the suite of the 1840 and 1955 flank eruptions of Kilauea in the east rift zone. Within the 1955 suite, the relative ages of eight flows are known. A distinct trend, the Kilauea line, is shown graphically in terms of iron/magnesium and alkali enrichment and is distinct from the Mauna Loa line (historic flows) and the Hawaiian alkali series line. In 1955, the more differentiated lavas were erupted first. Four new analyses of rocks from the 1921 eruption are presented, including a tachylyte and Pele's Hair.

G. M. B.

WALKER (F.) & PATTERSON (E. M.). *A differentiated boss of alkali dolerite from Cnoc Rhaonastil, Islay.* Min. Mag., 1959, **32**, 140-152, 2 figs., 2 pls.

An elongated boss of alkali-dolerite is described from Cnoc Rhaonastil, 5 miles E.N.E. of Port Ellen, on the island of Islay. An ophitic feldspar-rich analcime-olivine-dolerite or leucodolerite type has been intruded by *teschenite* with subhedral pyroxene; these types show local banding, and analcime-nepheline-syenite is a differentiation of both. Finer grained olivine-rich dolerite also occurs and probably represents the original magma. Chemical analyses, norms, and modes are given for all four types. These rocks are thought to be the product of normal crystal fractionation with slight absolute iron enrichment. Chemical analyses by W. H. Herdsman are given for pale brown olivine (A) (Fo_{56}) with α 1.725, β 1.750, γ 1.767, $2V\alpha$ 75° , sp. gr. 3.69-3.87, and violet-brown clinopyroxene (B) with α 1.698, β 1.706, γ 1.722, $2V\gamma$ 50° - 54° , sp. gr. 3.39-3.47, both from the leucodolerite.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	H_2O	Total
A	34.46	0.07	1.24	1.81	35.84	0.72	24.95	0.53	0.28	0.15	100.00
B	49.14	1.88	3.53	2.27	8.05	0.26	12.53	21.54	0.52	0.48	100.22

R. A. H.

PARKER (RONALD B.). *Magmatic differentiation at Amboy Crater, California.* Amer. Min., 1959, **44**, 656-658, 1 fig.

Amboy Crater provides an excellent example of magmatic differentiation of basaltic magma. Specimens studied were olivine basalts composed of a groundmass of glass, plagioclase, clinopyroxene, and magnetite with phenocrysts of olivine and plagioclase. Chemical and optical analysis of the samples showed that the younger the basalt the higher is the fayalite content of its olivine. During the course of crystallization, the liquids are successively enriched in silica and alkalies, and impoverished in magnesia and alumina.

A. C. H.

MOUNTAIN (EDGAR D.). *Acidification of dolerite at Coedmon quarries, Durban.* Trans. Geol. Soc. S. Africa, 1958, **61**, 210-219, 3 pls., 1 fig.

Incorporation of siliceous sediment by dolerite has caused acidification of the latter and the production of granophyre rocks by a process of metasomatic exchange. Ten new chemical analyses and petrographic descriptions are presented. It is suggested that the limit of possible acidification corresponds to a silica percentage of about 63; this and other criteria are established for distinguishing between acid dolerites produced by contamination and by magmatic differentiation.

E. S. W. S.

BARTH (T. F. W.). *Temperature relations of the mineral facies of metamorphic rocks.* Journ. Madras Univ., 1957, **27**, Centenary number, 37-48.

A review of current concepts on metamorphism, metasomatism, facies, and geological temperature indicators. Rocks and magmas are thought to be nonexistent at temperatures of less than 650°C, which is considered a natural boundary between metamorphism and magmatism.

A. P. S.

NICHOLLS (G. D.). *Autometasomatism in the lower spilites of the Builth volcanic series*. Quart. Journ. Geol. Soc., London, 1958, **114**, 137–162, 1 pl., 3 figs.

The development of two contrasted series of metamorphic changes in porphyritic and amygdaloidal spilites is attributed to the formation of two immiscible liquid fractions at a late stage of crystallization. It is suggested that one fraction, rich in volatiles, Ca, Mg, and Fe, gave rise to the amygdaloids, and also caused replacement of plagioclase by pumpellyite at the margins of flows and sags, while the residual silicate fraction was correspondingly enriched in Na and Si, and caused the albitisation of oligoclase and chlorite.

W. J. W.

Petrology : sedimentary.

UNGÁR (T.). *Erfahrungen über die Hagerman-Methode*. Acta Univ. Szegediensis, 1958, **11**, 51–60, 6 figs.

A discussion on the relationship between grain shape and mode of occurrence of minerals in detrital sediments.

R. A. H.

SWANN (D. H.), FISHER (R. W.), & WALTERS (M. J.). *Visual estimates of grain size distribution in some Chester sandstones*. Circ. Illinois State Geol. Survey, 1959, no. 280, 43 pp.

Grain size distribution was estimated by measuring, under stereoscopic microscope fitted with an eyepiece micrometer, grains judged visually to represent the maximum size, and fifth, sixteenth, fiftieth, eighty-fourth, and ninety-fifth percentile. Although less accurate than mechanical analysis, the visual method proved as accurate as sample-to-sample variability of most sedimentary warrants.

W. A. Wh.

NAGY (BARTHOLOMEW) & WOURMS (JOHN P., Jr.). *Experimental study of chromatographic-type accumulation of organic compounds in sediments: An introductory statement*. Bull. Geol. Soc. America, 1959, **70**, 655–660, 1 fig.

Both ion-exchange and adsorption-chromatography experiments show that small amounts of organic compounds can be subjected to chromatographic processes when they are migrating through sedimentary mineral matter. It is suggested that chromatography is a step in the preferential accumulation of organic compounds in sedimentary rocks.

A. L. A.

SHIMADA (I.). *Organic constituents of the alluvial lagoon sediments from the Hachiro-gata, Akita Prefecture*. Sci. Rept. Tohoku Univ., ser. 3, 1959, **6**, 193–207, 6 figs.

The results of chromatographic analyses of lipid extracts from core samples are tabulated in terms of paraffin-naphthalene, aromatic, asphaltic, and free sulphur fractions. The hydrocarbons are believed to be primary constituents, gradually formed by diagenetic alteration of organic matter within the sediments under eutrophic conditions.

R. A. H.

KATO (I.) & ABE (M.). *The non-hydrocarbon constituents of the resource rocks of petroleum (II)*. Sci. Rept. Tohoku Univ., ser. 3, 1958, **6**, 11–24, 3 figs.

——— *Minor and trace elements of the core samples from the Koya exploratory well, R.113, Yabase oil-field, Akita Prefecture*. Ibid., 1959, **6**, 185–192, 1 fig.

The results of semi-quantitative spectrographic analyses of rocks of Yamagata and Akita prefectures are tabulated. [M.A. 14–43]

G. D. N.

CRAMPTON (C. B.). *Heavy minerals in certain Old Red Sandstone and Silurian limestones of Monmouth*. Nature, 1959, **183**, 485.

Besides zircon, tourmaline, rutile, and garnet, some pyroxene was noted.

M. J. Le B.

JACOB (K.), RAMASWAMY (S. K.), RIZVI (S. R. A.), & KRISHNAMURTHY (A.). *Sedimentological studies in parts of Jharia and East Bokaro Coalfields*. Proc. Nat. Inst. Sci. India, 1958, **24**, A, 339–357, 1–7 figs.

Heavy mineral assemblage of the Talchir stage is characterized by predominance of garnet and more or less complete absence of tourmaline; while the assemblages from the Barakar stage contain a high proportion of tourmaline and fair amounts of zircon with little or no garnet. A transition stage at the base of Barakar is recognized by its heavy mineral assemblage which contains both garnet and tourmaline, the garnets showing etching.

A. P. S.

NOSSIN (J. J.). *Geomorphological aspects of the Pisuega drainage area in the Cantabrian mountains (Spain)*. Leidse Geol. Mededelingen, 1959, **24**, 283–406, 52 figs., 17 tables, 2 maps. (Spanish summary.)

The sedimentary petrography of the Pisuega, Rubagón and Camesa terraces is given; tourmaline, zircon, and rutile are dominant in the heavy mineral composition. Preliminary remarks on clay mineral compositions form an appendix.

P. C. Z.

MABESOONE (J. M.). *Tertiary and Quaternary sedimentation in a part of the Duero Basin, Palencia, Spain*. Leidse Geol. Mededelingen, 1959, **24**, 31-180, 48 figs., 4 pls., 14 tables. (English, Esperanto, and Spanish summaries.)

In a special chapter on mineral associations attention is paid to the heavy, light, and clay minerals. Differences in the heavy mineral composition are small. The associations do not coincide with the boundaries of the facies as determined in the field. The group of resistant minerals dominates the associations. The light mineral associations are of no importance towards determining source areas and palaeoclimates. The clay minerals, investigated by the X-ray powder method, which are present in the various facies allow some conclusions to be drawn about the climate at the periods of deposition.

P. C. Z.

SMITH (W. E.). *The siliceous constituents of chert*. Geol. en Mijnbouw, 1960, new ser., **22**, 1-8, 4 figs.

Chalcedony, ordinary quartz, and opal are the various siliceous constituents of chert. Usually opal is not present in chert, and microcrystalline or cryptocrystalline quartz is dominant. This can be termed chalcedony when it possesses certain anomalous optical properties which appear to be due to varying concentrations of sub-microscopic, fluid-filled cavities (cryptopores). A survey of the siliceous constituents encountered by the author in his study of British cherts is given and a classification and terminology proposed.

P. C. Z.

KERR (MARGARET H.). *On the occurrence of silcretes in southern England*. Proc. Leeds Phil. Soc., 1955, **6**, 328-337, 1 fig., 2 pls.

The puddingstones and associated sarsens of southern England are regarded as silcretes, formed by the weathering in situ of the bedrock and the subsequent cementation of the rock debris by precipitation of silica from ascending solutions. They are similar to silcretes from South Africa and Australia. Chemical analyses are given of a black flint pebble, the fine-grained siliceous matrix, and the rock as a whole, for Hertfordshire puddingstone from Newberries Park, Radlett, Hertfordshire.

R. A. H.

SCHEERE (J.). *Conglomérats intraformationnels et à galets mous du Westphalien belge*. Bull. Soc. belge Géol., 1957, **66**, 236-251, 3 figs., 1 pl.

Detailed description of the conglomerates, restricted in lateral extension, with pebbles of ironstone and shale which are found in the Belgian coal measures; and also of ironstone with soft kaolinite grit occurring at the Beringen colliery, Limbourg.

F. Sch.

SCHEERE (J.). *La pétrologie des tonstein du Houiller belge*. Bull. Soc. belge Géol., 1957, **66**, 300-317, 3 figs., 1 pl. (photomicros.).

A tonstein found in the collieries of Limbourg-Meuse is described and an attempt is made to correlate it with those found in other Belgian mines. Macro- and microscopic characters, chemical analyses, and X-ray data for various tonsteins are given. The conditions for the formation of such rocks and their importance in correlation and in palaeogeography are specially discussed. [M.A. **14**-9798]

F. Sch.

FULLER (ARTHUR O.). *A contribution to the petrology of the Witwatersrand System*. Trans. Geol. Soc. S. Africa, 1958, **61**, 19-50, 1 fig., 6 pls.

Detailed macroscopic and microscopic descriptions of shales and sandstones from the Witwatersrand System are accompanied by three new chemical analyses and modal data. Fine-grained phyllosilicates and compositions of chlorites were determined by X-ray powder analysis. Pyrophyllite is found to be common in rocks of the Upper Division and its formation is ascribed to a phase of pre-consolidation hydrothermal activity.

E. S. W. S.

PETTIJOHN (F. J.) & BASTRON (HARRY). *Chemical composition of argillites of the Cobalt Series (Precambrian) and the problem of soda-rich sediments*. Bull. Geol. Soc. America, 1959, **70**, 593-600, 3 figs.

Two new chemical analyses, gravimetric and spectrographic, of Precambrian glacial sediments, varved argillites of the Huronian Cobalt Series in Ontario, Canada, were made in an attempt to obtain a composite sample of a large part of the Canadian Shield as it was in Huronian times. The analyses show that the argillites contain more Na₂O than K₂O and have a Na₂O/K₂O ratio higher than in most pelitic rocks but similar to that found in many graywackes. The CaO content is similar to that of Precambrian pelitic rocks but much lower than that of Grout's average of the rocks of the Canadian Shield and of Clarke and Washington's average of the igneous rocks of Eastern Canada. Published analyses are cited to substantiate these observations. Albitization of detrital plagioclase feldspar is inferred to account for the low lime and high soda content of the rocks.

A. L. A.

WHITE (W. ARTHUR). *Chemical and spectrochemical analyses of Illinois clay materials*. Circ. Illinois State Geol. Survey, 1959, no. 282, 55 pp.

About 500 chemical analyses and 30 spectrochemical analyses of shales, clays, tills, loesses, alluviums, and so on are compiled.

D. H. S.

ESTEROFF (W. D.), HINTERLECHNER (A.), & SABATIER (G.). *Sur la composition de quelques vases méditerranéennes*. Bull. Soc. franç. Min. Crist., 1958, **81**, 72-73.

The blue muds of the Golfe de la Napoule, French Riviera, consist of quartz, calcium carbonate, and about 10% clay minerals. The latter are mainly illite, with a lesser amount of chlorite. R. A. H.

HAMILTON (EDWIN L.) & REX (ROBERT W.). *Lower Eocene phosphatized Globigerina ooze from Sylvania Guyot*. Prof. Paper U.S. Geol. Survey, 1959, **260-W**, 785-798, 5 pls.

Sylvania Guyot is a flat-topped seamount northwest of Bikini Atoll, Marshall Islands. *Globigerina* ooze, obtained by a series of dredge hauls, shows X-ray diffraction patterns (indexed data given) corresponding to those of dehrnite and ancolite [M.A. 7-88]. The four strongest lines (d/I) are: 2.79 (10), 2.77 (8), 2.69 (5), 3.45 (4). K. S.

ASPERSON (WILLIAM C.). *Rapid crystal growth in coquina rock of Florida*. Rocks and Minerals, 1957, **32**, 338.

Boulders of coquina rock used in building channel jetties

at Fort Pierce, Florida, grow together naturally by the relatively rapid formation of tiny calcite crystals and crystalline masses. R. S. M.

FISK (HAROLD N.) & McCLELLAND (BRAMLETTE). *Geology of the continental shelf off Louisiana: its influence on offshore foundation design*. Bull. Geol. Soc. America, 1959, **70**, 1369-1394, 12 figs., 4 pls.

Foundation problems for drilling structures offshore from Louisiana are related to the shearing strength and scour resistance of near-surface late Quaternary continental-shelf deposits. Study of the late Quaternary facies and their relation to shelf topography makes it possible to map the sediment types and to date them. Compression tests on clay samples at several offshore locations have confirmed and extended correlations between the shear strength of clay deposits and the type and abundance of clay minerals. The tests permit recognition of four categories of strength variation with depth. A. L. A.

BASSETT (A. M.), KUPFER (D. H.), & BARSTOW (F. C.). *Core logs from Bristol, Cadiz, and Danby dry lakes, San Bernardino County, California*. Bull. U.S. Geol. Survey, 1959, **1045-D**, 97-138.

K. S.

TOPOGRAPHICAL MINERALOGY

HEUMANN (H.). *Contributions to the mineralogy of Norway. No. 1. An introduction*. Norsk Geol. Tidsskr. 1959, **39**, 231-236.

Mineral species which were overlooked in the review of minerals found in Norway, published by I. Oftedal [M.A. 0-407], and species which have been found in Norway since 1948 are listed. The article also includes a list of Norwegian mineralogical publications printed since 1948. K. S. H.

LEY (M. H.). *A new occurrence of erionite*. Min. Mag., 1959, **32**, 343.

Erionite has been recognised as a white compact fibrous mineral, refr. ind. ≈ 1.47 , associated with chabazite, in two half-geodes in an old collection from the Faroe Islands; probably from the Faroese basalt. [M.A. 14-412]

R. A. H.

UTENBOER (TONY VAN) & SKJERLIE (FINN J.). *Brannerite, a new mineral in Norway*. Norges Geol. Unders., 1957, no. 200, 5-7.

A mineral occurring in fissures in an Archaean greenish schist at Haugfoss in Modum, SE. Norway, is shown to be

brannerite by radiometric, X-ray, and spectrochemical methods. The mineral is highly metamict. I. W. O.

NORIN (R. B.). *Some data concerning the mineralogy of the Karlshamn granite*. Geol. Fören. Förh. Stockholm, 1957, **79**, 35-42.

The Karlshamn granite, occupying considerable areas of the middle part of the province of Blekinge in southeastern Sweden, contains the minerals quartz, microcline, oligoclase, biotite, sphene, apatite, zircon, and magnetite with some secondary sericite, chlorite, and calcite. The minerals were isolated by heavy liquid and magnetic separation. The plagioclase represents two generations, an earlier, with composition An_{30} , and a younger, more sodic. The former appears as individuals with rounded corners within the large eyes of microcline. The relations between chemical composition and optical properties of the microcline and the biotite are elucidated. Two chemical analyses of the granite are given. E. Å-n

KNORRING (O. VON) & DEARNLEY (R.). *Molybdenite associated with Laxfordian gneisses at Loch Stack, Sutherlandshire*. Min. Mag., 1959, **32**, 344-345.

Molybdenite is reported from amphibolites and other hornblende-bearing country rocks adjacent to a quartz-albite-oligoclase pegmatite in a road cutting $1\frac{1}{4}$ miles north of Achfary, near the southern shore of Loch Stack, Sutherlandshire. The molybdenite occurs as aggregates up to half an inch across and is locally associated with pyrite.

R. A. H.

PATERSON-NISBET (A.). *A manganese occurrence in Wigtownshire*. Mining Mag., 1959, **101**, 318–320, 3 figs.

Black manganese ore is reported from the base of a raised beach at Luce Bay, between Glenluce and Port William, Wigtownshire, Scotland. A sample, scraped from pebbles, gave H_2O 57.07, MnO_2 26.58 (61.90% for dried specimen). The manganese is believed to be of sedimentary origin, precipitated by the sea-weed *Fucus serratus*.

R. A. H.

HARTLEY (J.). *Coronadite from Cumberland*. Min. Mag., 1959, **32**, 343–344.

Coronadite, $\text{MnPbMn}_6\text{O}_{14}$, is reported as a silver-white metallic mineral associated with massive quartz, psilomelane, and campylite from dumps in Dry Gill, Cumberland. It occurs also as a dull black, fibrous, botryoidal mineral, indistinguishable from psilomelane in hand specimen. Dry Gill is believed to be part of a manganiferous outer zone associated with the centre of tungsten mineralization in Grainsgill to the south. [M.A. **8**–289, **9**–43, **10**–227]

R. A. H.

RAYMOND (L. R.). *Recent secondary minerals in the Billingham anhydrite mine*. Min. Mag., 1959, **32**, 172–175, 1 fig.

A number of secondary minerals have grown in recent years in a part of the Billingham, Durham, anhydrite mine, by evaporation of water from the Upper Magnesian Limestone. Multicoloured efflorescences were found to contain halite, thenardite, gypsum, epsomite, talc, sylvine, pyrite, sulphur, and lepidocrocite. Ilseemannite, tamarugite, tachydrate, a ferric sulphate, and ferric chloride were probably present, while possible or doubtful species include apthitalite, arsenopyrite, and molybdenite. A dark blue efflorescence was remarkably rich in molybdenum (MoO_3 6.4%).

R. A. H.

BROWN (P. E.). *A note on pyrosmalite from Nant Francon, North Wales*. Min. Mag., 1959, **32**, 242–244, 2 figs.

Ordovician slate in contact with intrusive rhyolite in association with the Bwlch-y-Cywion intrusion has been altered to a massive dark green rock containing a chloritic mineral, almandine-spessartine garnet, iron ore, apatite, and minor pyrosmalite: this is the first recorded occurrence of

pyrosmalite in the British Isles. The pyrosmalite occurs as clusters of radiating crystals around 0.5 mm in length; it has ϵ 1.638, ω 1.662. [M.A. **12**–236, **13**–374]

R. A. H.

RHODEN (H. N.). *Mineralogy of the Silvermines district, County Tipperary, Eire*. Min. Mag., 1959, **32**, 128–139, 3 pls.

The paragenesis of a suite of hydrothermal minerals including pyrite, chalcopyrite, blende, tetrahedrite, galena, baryte, ankerite, quartz, sericite, and chlorite (brunsvigite) at four mines in the Silvermines district is discussed. The alteration of pyrrhotine to marcasite is considered to have taken place solely by loss of iron. The marginal replacement of blende by chlorite and the possible formation of primary goethite are reported. The occurrence of gummundite is recorded for the first time in the British Isles.

R. A. H.

WALKER (G. P. L.). *The amygdale minerals in the Tertiary lavas of Ireland. II. The distribution of gmelinite*. Min. Mag., 1959, **32**, 202–217, 4 figs.

Mapping of the distribution of zeolites in the Antrim basalts has shown that gmelinite is confined to a narrow zone along the eastern seaboard comprising less than 1% of the area of the basalts, but that in this zone gmelinite is extremely abundant. The gmelinite frequently forms parallel overgrowth on chabazite. The zone is found in the basal parts of the lava pile and the minerals in it are clearly later than the lavas. Superimposed on the southern part of the gmelinite zone is a zone of late chabazite and heulandite. [M.M. **17**–274, **29**–773]

R. A. H.

LIEBER (WERNER) & MALARKEY (WILLIAM J., Jr.). *Petrofacts and minerals from oil-schist mine at Messel near Darmstadt, Hessen, Germany*. Rocks and Minerals, 1957, **32**, 547–551, 5 figs.

The oil-schist is black-gray in colour, contains water 4% ash 35, and oil 7–8%. Numerous fossils found in the deposit are described. Pyrite, marcasite, selenite, and messelite occur in the rock, messelite [M.A. **8**–218] as radiating aggregates and occasionally as single crystals from 2 to 4 mm long.

R. S. M.

BOSAZZA (V. L.). *Radioactive minerals in southern Nyasaland*. Mining Mag., 1959, **101**, 49–55, 3 figs.

Radioactive minerals from the Tambane and Mwanza fault areas include uraninite, pitchblende, betafite, samarskite, davidite, monazite, allanite, zircon, and weakly radioactive sphene. Betafite from Quarry, Eastern Range, has SiO_2 0.58, TiO_2 0.36, Nb_2O_5 62.7, U_3O_8 28.3, $\text{H}_2\text{O} +$ 5.4, $\text{H}_2\text{O} -$ 2.24, = 99.65 (analyst V. L. Bosazza). Analysis

also given of a further betafite and of two allanites. The d.t.a. curves obtained for davidite, epidote, allanite, plumbite, and betafite are figured. These minerals are stated to occur not necessarily in pegmatitic rocks but mainly in quartz-granulite and some schists as well as in altspathic gneisses.

R. A. H.

MURAKOSHI (TSUTASA) & KOSEKI (KÔJI). *Summary of geology and mineralogy of the uranium and thorium deposits in Japan*. Proc. 2nd U.N. Conf. Peaceful Uses Atomic Energy, 1958, **2**, 720-731, 14 figs.

Miocene lacustrine sandstones and conglomerates with fracture fillings of autunite and meta-autunite form the most important deposit. Uraniferous lignite and placers bearing monazite, uranothorite (enalite), zircon, refractories, and allanite are recorded. Radioactive species in the mineralization associated with Cretaceous and Palaeogene acid plutons include uraninite, coffinite, monazite, and secondary autunite, torbernite, zeunerite, hydrous uranopolyphates and uranovanadates. Reference is made to uraniferous bismutite and koechlinite.

J. R. H.

YAMA (T.). *Autunite from the Ningyô Pass, on the boundary between Tottori and Okayama prefectures, Japan*. Journ. Min. Soc. Japan, 1957, **3**, 214-217.

Autunite (anal., opt., X-ray data are presented) occurs disseminated through conglomerate and sandstone of the Upper Tertiary uranium-bearing lacustrine beds, overlying biotite granite.

R. A. H.

HARIYA (YU). *Studies of mineralogical and geological distribution of manganese dioxide minerals in Hokkaido, Japan*. Journ. Min. Soc. Japan, 1958, **3**, 565-591, 25 figs., 2 pls. (Japanese; English summary, *ibid.*, 797-798).

X-ray powder data are tabulated and d.t.a. curves are given for pyrolusite, manganite, ramsdellite, and cryptomelane. Birnessite and ranciéite were found in manganese sands from the Komagadake mine. The geological distribution of these deposits is summarized. [M.A. **13**-596, 4-111]

R. A. H.

TOGARI (K.). *Sphalerite from the Shimokawa mine, Hokkaido, Japan*. Journ. Min. Soc. Japan, 1958, **3**, 702-709. (Japanese; English summary, *ibid.*, 803-804.)

Blende occurs with pyrrhotine, cubanite, and galena in a pyrite and chalcopyrite ore at a diabase-slate contact. For mine blendes an attempt is made to relate the colour with the content of Fe and other trace elements semi-quantitatively determined by X-ray fluorescence analysis. Ag,

Sn, and Pb are found in blendes from the central part of the ore body, while Bi, Te, and Ga are present in its outer part.

R. A. H.

SAKURAI (K.), TABATA (S.), & KATO (A.). *Xenotime from Takehara, Mie Prefecture*. Journ. Min. Soc. Japan, 1958, **3**, 784-786, 2 figs. (Japanese; English summary, *ibid.*, 808.)

—— ——— *Monazite and fergusonite from Takehara, Mie Prefecture*. *Ibid.*, 787-790, 4 figs. (808).

Xenotime, monazite, fergusonite, and zircon occur in a granite pegmatite. The xenotime occurs as bluish grey pyramidal crystals with $z\{101\}$, $a\{100\}$, and $l\{121\}$ in parallel growth with zircon, as dark grey crystals in a radial aggregate, and as greyish green aggregates. Monazite forms greenish grey brown prismatic or platy crystals with $a\{100\}$, $m\{110\}$, and $v\{111\}$ and rarer $n\{120\}$, $e\{011\}$, $w\{101\}$, and $x\{101\}$. The fergusonite occurs as small blackish crystals occasionally showing forms $s\{111\}$ and $g\{320\}$.

R. A. H.

ADATI (K.) & HARIYA (YU). *Studies of limonite ore from the Shinmei mine, Hokkaido*. Journ. Min. Soc. Japan, 1958, **3**, 533-538, 3 figs., 1 pl. (Japanese; English summary, *ibid.*, 794.)

Chemical analyses, d.t.a., and X-ray powder data are given for specimens of siliceous limonite. The ore mineral is shown to be goethite.

R. A. H.

TAKEUCHI (T.) & NAMBU (M.). *On valleriite in north-east Japan (studies on the minerals of Cu-Fe-S series in Japan, third report)*. Sci. Rept. Tohoku Univ., 3rd ser., 1959, **6**, 323-329, 2 figs.

Details are given of the occurrence of valleriite in various forms in intergrowth with chalcopyrite and cubanite in the Akagane, Kamaishi, and Omine mines, Iwate Prefecture. The valleriite is less yellowish and more reddish than chalcopyrite, harder than chalcopyrite and softer than pyrrhotine, shows pleochroism yellow to violet-grey, and is markedly anisotropic. [M.A. **14**-162]

R. A. H.

TOMICH (S. A.). *Report on a spodumene-bearing pegmatite on Hampton Plains location 53, south of Kalgoorlie, W.A.* Geol. Survey W. Australia, 1956, Ann. Progr. Rept. (for 1953), 11-12.

A pegmatite intrusive into greenstone schists, two miles from a granite outcrop, 22½ miles south of Kalgoorlie, contains spodumene, beryl, and columbite in addition to quartz, feldspars, and mica. In one section of the pegmatite spodumene amounts to 40% by volume, with crystals

18"×4": this is flanked by a spodumene-beryl-quartz portion with bluish-grey beryl. The spodumene has Li_2O_3 6.08% [M.A. 13-466].

R. A. H.

WODZICKI (A.). *Radioactive boulders in Hawks Crag breccia* [New Zealand]. New Zealand Journ. Geol. Geophys., 1959, 2, 385-393, 3 figs.

Biotite hornfels from Big River (Westland province) contains 0.18% U_3O_8 ; the uranium is contained in an unidentified opaque mineral steel-blue in reflected light and with moderate to high reflectivity. X-ray powder and spectrographic data are given for the mineral, which consists essentially of iron with smaller amounts of Si, Cu, Ba, Ti, U, and Cr. Granite (0.025% eU_3O_8) from Big River contains an iron-rich biotite with $\gamma = \beta$ 1.656, α 1.591. Radioactivity is apparently due to accessory apatite and zircon. Hematite-stained biotite hornfels from the lower Buller Gorge (Nelson province) shows two portions, one with 1.7% eU_3O_8 and containing 50% of opaque ore minerals, the other with 0.2% eU_3O_8 and 1-2% opaque ore minerals. Radioactivity is mainly due to accessory uraninite—the first record of this mineral in New Zealand. The age of the mineralization and the genetic significance of the boulders are discussed. [See also M.A. 14-259]

W. A. W.

REED (J. J.) & CLARIDGE (G. G.). *Identification of coffinite in radioactive rocks of the Buller Gorge Region, New Zealand*. Nature, 1957, 179, 546.

Coffinite, $\text{U}(\text{SiO}_4)_{1-x}(\text{OH})_{4x}$, has been identified by X-ray powder patterns as a primary constituent. Full details will be published elsewhere.

C. J. E. K.

WILLIAMS (GORDON J.). *New mineral discoveries in the Nelson province*. Thomas Cawthron Memorial Lecture, no. 32, 1957, 29 pp., 3 figs., 5 pls. Nelson, New Zealand (R. W. Stiles & Co. Ltd.).

A popular account of the potentialities of uranium mining in New Zealand. Uranium has been found as coffinite (preceding abstract) in the Hawk Crag breccia (Lower Cretaceous) in the Buller River region, and in areas 25 miles to the south-west. A lead age determination gives $100-150 \times 10^6$ years. Scheelite from a granite-limestone contact at Canaan, Pikikuruna Range, and vermiculite are also recorded.

D. S. C.

DAVIES (J. F.). *Geology of the Wanipigow River area, Manitoba*. Manitoba Mines Branch Publ., 1950, 49-3, 21 pp., 1 map.

Gold with pyrite and ankerite in quartz veins occurs at the San Antonio Gold Mine in this area south-east of Lake Winnipeg. Rocks in the area are all Precambrian, and consist of metamorphosed lavas and sediments (Rice Lake

Group) intruded by diabase (containing the gold-bearing veins) and gabbro, in turn intruded by granitic rocks, and all overlain by quartzite. [The abstractor has described gold with a thin red coating which is probably copper, from this mine]. [A.M. 35-459]

R. B. F.

BAILLIE (A. D.). *Silurian geology of the Interlake area, Manitoba*. Manitoba Mines Branch Publ., 1951, 50-1, 82 pp., 1 pl., 6 figs., 1 map.

Between Lake Winnipeg on the east and Lakes Manitoba and Winnipegosis on the west in an area of about 40 square miles occurs white to grey gypsum, some fibrous and some as selenite crystals up to 2 feet across, in beds as thick as 24 feet which grade downward into bluish-gray anhydrite for a total depth of 150 feet. The age of the evaporite is uncertain. The surrounding rocks are Silurian 'dolostones' and shales, and some of the former are quarried to produce lime. Moulds of hopper-shaped halite crystals from boulders in this area have been described. [M.A. 9-119]

R. B. F.

DAVIES (J. F.). *Geology of the Manigotagan-Rice River area, Manitoba*. Manitoba Mines Branch Publ., 1951, 50-2, 16 pp., 2 maps.

Oolitic and pisolitic hematite with calcite form steep cliffs for about half a mile on the south shore of Black Island in the south-east part of Lake Winnipeg. This deposit has been described in some detail [Trans. Canad. Inst. Mining Metall. 1945, 48, 284-293.] The hematite adjoins Precambrian quartz sericite schist, and rests on massive pyrite from which it has weathered. Rocks in the area consist of Precambrian lavas and sediments intruded by granites and gabbros, and overlain in part by Ordovician dolomites and sandstones. Some gold occurs in the Precambrian rocks.

R. B. F.

RUSSELL (G. A.). *Geology of the Lily Lake-Kickley Lake area, Manitoba*. Manitoba Mines Branch Publ., 1951, 50-3, 17 pp., 9 maps.

In this area south-east of Lake Winnipeg in Precambrian sediments and volcanics intruded by granite and diorite occur (1) frequent quartz veins carrying some or all of gold, pyrite, chalcopyrite, arsenopyrite, blende, tourmaline, and ankerite, (2) beds of siliceous hematite-magnetite ('iron formation') and ferruginous limestone, and (3) small amounts of asbestiform serpentine in pyroxenite.

R. B. F.

GILL (J. C.). *Geology of the Mystery Lake area, Manitoba*. Manitoba Mines Branch Publ., 1951, 50-4, 20 pp., 1 pl., 1 map.

A reconnaissance survey of this area 150 miles north of Lake Winnipeg shows the rocks to consist of Precambrian

sediments and volcanics intruded by granitic rocks and later peridotite and gabbro. Silver-bearing galena occurs in small veins in andesite at one locality. Pyrrhotine, pentlandite, chalcopyrite, and blende occur in peridotite which outcrops over an area 425 feet by 50 feet on the south shore of the lake. [This outcrop and its extension are now (1959) being developed as a huge nickel-copper mine.]

R. B. F.

HAW (D. M.). *Radioactive mineral occurrences of the province of Quebec*. Geol. Rept. Dept. Mines, Province of Quebec, 1958, no. 80, 52 pp., 11 (map) figs. Also available in French: Minéraux radioactifs dans la province de Québec. Rapport Géologique, 80, 1-61, 11 map figures.

In this list of radioactive mineral occurrences, emphasis is placed on petrographic description of the locality. The following minerals have been reported from localities in the Province of Quebec: uraninite (pitchblende, thucholite), uranothorite and thorite, monazite, allanite, uranophane. Most of the radioactive occurrences described fall within the area known as the Grenville subprovince (Precambrian) of southern Quebec; the associated rock types are granite pegmatites, granites, calcite-rich rocks, pyroxenites, fluorite-rich rocks, and molybdenite-rich rocks. [M.A. 14-399]

G. P.

HICKS (W. D.). *Eudialyte and eucolite in Canada*. Canadian Min., 1958, **6**, 297-298.

From spectrographic, X-ray powder, and optical determinations, a pink mineral from Pontiac County, Quebec, was identified as eucolite (optically negative), and another from Seal Lake, Labrador, as eudialyte (optically positive).

R. B. F.

DAWSON (K. R.) & SABINA (ANN). *A Canadian occurrence of fairchildite and buetschliite*. Canadian Min., 1958, **6**, 290-291, 1 table.

'From the trunk of a partially burned hickory tree near Deseronto, Ontario.' Identified by spectrographic and X-ray powder analyses.

R. B. F.

MAWDSLEY (J. B.). *The radioactive pegmatites of Saskatchewan*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses Atomic Energy, 1958, **2**, 484-490, 1 fig.

The mineralogy and origin of the pegmatites are discussed and three age determinations given. Radioactivity is due to uraninite, monazite, apatite, and zircon. J. R. H.

CADY (W. M.), WALLACE (R. E.), HOARE (J. M.), & WEBBER (E. J.). *The central Kuskokwim region, Alaska*. U.S. Geol. Survey, 1955, Prof. Paper **268**, vi + 132 pp., 38 figs., 9 pls.

A 60,000 to 100,000 feet thick series of sedimentary and volcanic rocks chiefly of marine deposition, of Palaeozoic to Mesozoic age, has been intruded by igneous rocks. The principal types of igneous rock in the region, in general order of formation, are andesite, biotite basalt, albite rhyolite, basalt, quartz monzonite, and quartz diabase. The rhyolitic volcanic rocks are believed to be extrusive phases of the hypabyssal albite rhyolite: two chemical analyses are given of porphyritic albite rhyolite. Quartz monzonite and related granites and granodiorites form stocks of probable middle Tertiary age; eighteen chemical analyses show that these stocks are slightly alkaline. Argillite occurs near bodies of albite rhyolite and hornfels in contact-metamorphic zones adjacent to the quartz monzonites. Mineral veins occur intersecting the igneous rocks and three episodes of lode mineralization are recognised: gold-quartz-tungsten, copper sulphide-gold-silver, and quicksilver-antimony. Minerals recorded in these ores include cinnabar and stibnite in and near silica-carbonate rocks formed by the hydrothermal alteration of biotite basalt, gold, scheelite, realgar, pyrite, native mercury, orpiment, cassiterite, arsenopyrite, chalcopyrite, pyrrhotine, scorodite, and traces of metazeunerite.

R. A. H.

WISE (W. S.). *An occurrence of geikielite*. Amer. Min., 1959, **44**, 879-882, 2 tables.

Geikielite, MgTiO_3 , is described from the Santa Lucia Mountains, Monterey County, California, U.S.A. It occurs as small black opaque grains with rutile and spinel in magnesian marble. Indexed X-ray powder data and cell dimensions are given for two samples and are compared with those for ilmenite. Iron content of the geikielite was estimated from density and X-ray measurements. The geikielite formed in a Mg- and Ti-rich environment which was deficient in iron and silica.

B. H. B.

ALLEN (FRED). *Mineral resources of North Carolina*. Rocks and Minerals, 1958, **33**, 301.

More than 300 kinds of rocks and minerals are known to occur in North Carolina. The major mineral resources are outlined according to the Coastal Plain, Piedmont Plateau, and Mountain regions.

R. S. M.

KING (C. HENRY). *The 100 counties of North Carolina*. Rocks and Minerals, 1958, **33**, 315-321.

The counties of North Carolina are listed alphabetically; and under each is a short paragraph describing mineral occurrences. No references to sources of information are given.

R. S. M.

TURLEY (TOMASZ J.). *On the minerals of the Chicago area*. Rocks and Minerals, 1959, **34**, 393-395.

This summary of the geology and mineralogy of the

Chicago area was compiled from the literature as well as from personal observations. The bedrock of the region consists of Silurian (Niagara formation) limestones and dolomites. Minerals found in these rocks include: native sulfur, argentite (very rare), chalcocite, galena, sphalerite, chalcopyrite, pyrite, marcasite, millerite, quartz (chert, chalcedony), opal, calcite, dolomite, melanterite, glauconite, illite, kaolinite, and asphalt. The possibility of finding celestite and baryte in the formation is suggested from chemical analyses of the dolomite. Of the 82 mineral types reported in the Chicago area less than 25 belong to the bedrock. The remaining, to be published later, occur in glacial drift and recent deposits. Some attention is given to the beach sands; also general comments on the geochemistry and economic geology of the area are given. R. S. M.

GLASS (JEWELL J.), ROSE (HARRY J. Jr.), & OVER (EDWIN). *Notes on the mineralogy of an yttrium-bearing pegmatite body near Lake George, Park County, Colorado.* Amer. Min., 1958, **43**, 991-994.

The most important yttrium-bearing minerals in this pegmatite, allanite, gadolinite, monazite, and xenotime, occur in masses of fluorite. Optical observations on these minerals and semiquantitative spectrographic analyses of 16 rock and mineral samples are reported. A. P.

ZODAC (PETER). *Minerals at Thomaston Dam, Conn.* Rocks and Minerals, 1959, **34**, 3-4 & 48.

An account is given of a mineral collecting trip to Thomaston Dam near Thomaston, Litchfield County, Connecticut. The following minerals occur associated with a dike in mica schist which has been cut through for a railroad bed: fluorite (green and purple), galena, blende, chalcopyrite, pyrite, calcite, baryte, microcline, muscovite, quartz, zircon, stilbite, and limonite. R. S. M.

SHAUB (MARY S.). *Mineral collecting in the Black Hills area of South Dakota.* Rocks and Minerals, 1958, **33**, 394-397 & 437, 1 fig.

Mineral occurrences discussed in some detail are: sand-calcite crystals at Rattlesnake Butte; golden baryte crystals near Wasta; fossil-bearing concretions in Pierre shale near Elk Creek; agates near Fairburn; agates in Tepee Canyon; and several well-known pegmatites in the Black Hills. R. S. M.

REYNOLDS (BOB) & REYNOLDS (HAZEL). *Delving into Delaware.* Rocks and Minerals, 1957, **32**, 346-347.

A brief discussion is given of the minerals found in Delaware. Considerable attention is paid to petrified

wood. Other minerals found in the state are: limonite (bog iron ore), salt, kaolinite, feldspar, mica, garnet, tourmaline, and amethyst. R. S. M.

LASMANIS (RAY). *The mineralogy of Moselle mine no. 10.* Rocks and Minerals, 1959, **34**, 331 & 341.

Minerals found in the Moselle Mine No. 10, located in Phelps County, Missouri, include pyrite, marcasite, hematite, limonite, amethyst, rock crystal, smoky quartz, jasper, selenite, calcite, dolomite, malachite, chalcanthite, melanterite, and copiapite. General comments on the paragenesis of the minerals are given. R. S. M.

SHAUB (B. M.). *Garnet locality of Minot, Maine.* Rocks and Minerals, 1957, **32**, 227-234, 4 figs.

Grossular garnet crystals occur associated with diopside, quartz, scapolite (mizzonite), actinolite, chlorite, clinozoisite, and sphene in metamorphosed calcareous sediments at Minot, Maine. The rhombic dodecahedral, crystals, sometimes modified by the tetragonal trisoctahedron and hexoctahedron, are commonly 1 to 1½ inches across, and crystals up to 5 inches across have been obtained. Most of the crystals are opaque and vary in colour from light yellowish-brown to a dark brown and brownish amber. The geology and mineralogy of the deposit are discussed in detail. The history of the mining of the crystals is reviewed. R. S. M.

SHAUB (B. M.). *Quartz-barite occurrence along Morse Brook, Old Spec Mountain Quadrangle, Maine.* Rocks and Minerals, 1959, **34**, 387-389, 2 figs.

Quartz crystals line walls of cavities in a fault zone in biotite granite. Most of the quartz specimens consist of crystals 2 to 3 ins. thick. The crystals are stout and usually show terminal rhombohedrons with no prism faces. The crystal ends are sometimes clear and transparent, while the bases are milky. A few crystals have amethystine coloured tips. Baryte occurs as thin plates up to 1 in. side. Pyrite, mostly altered to limonite, is found with the massive quartz vein fillings. Detailed directions for reaching the site are given. R. S. M.

NAVRATIL (GERALD J.). *Montana, treasure state for the crystal mineral collector.* Rocks and Minerals, 1959, **34**, 110-114.

This paper contains a list of the less widely known crystal mineral localities in Montana. Important localities for 3 minerals are included. R. S. M.

PRIEST (AMEL). *Geode hunting in Nebraska.* Rocks and Minerals, 1957, **32**, 348-349.

Dogtooth calcite and milky and amethystine quartz

crystals are found in thin-shelled geodes in hard limestone near Holmesville, Nebraska. In quarries near Wymore, Nebraska, thick-shelled geodes, up to 7 ins. diam., occur in shaly limestone. Brightly fluorescent and phosphorescent calcite crystals occur in these. On Diamond Hill, near Odell, Nebraska, flat tabular baryte crystals of diamond shape occurring in a reddish shale are $< \frac{1}{4}$ in. across, pinkish-tan in colour, and show phantom lines.

R. S. M.

HUN (MING-SHAN). *Minerals of the Hansonburg mining district, Socorro Co., New Mexico*. Rocks and Minerals, 1957, **32**, 563–564.

The minerals of the district occur in ore bodies confined to various limestone formations of the Pennsylvanian system. The following minerals were verified:—hypogene minerals: chalcopyrite, dolomite, fluorite, galena, pyrite, quartz; supergene minerals: anglesite, atacamite, auriferous calcite, azurite, brochantite, celestite, cerussite, cyanochalcite, gypsum, jarosite, limonite, linarite, malachite, murchisonite, plattnerite, spangolite, wulfenite. R. S. M.

VEIDHAAS (ERNEST). *The large Bedford tourmaline group*. Rocks and Minerals, 1959, **34**, 390–392, 2 figs.

An account is given of the reconstruction of some black tourmaline crystal groups collected at the Kinkle Quarry, Bedford, New York. Fragments, recovered from a decomposed feldspar matrix, were reconstructed to form, in one case, a 42 lb cluster of 32 crystals, mostly about 2 ins. diam., and up to 18 ins. long. Another cluster 8 lb in weight consists of three large and twelve small crystals.

R. S. M.

SEGELER (C. G.). *Notes on a second occurrence of groutite*. Amer. Min., 1959, **44**, 877–878.

Black acicular striated crystals 1 to 5 mm long on calcite crystals were found in vugs in manganese-stained talc at Calville near Gouverneur, New York, U.S.A. [M.A. **10**–105, 1952, 536]

B. H. B.

FALLENBECK (WILLIAM H.). *Rock crystals with chlorite inclusions discovered in New York State*. Rocks and Minerals, 1959, **34**, 483–486, 2 figs.

Rock crystals with olive-green chlorite inclusions are found about 4 miles west of North Chatham, Rensselaer County, New York. The crystals are found in cavities in quartz veins in Cambrian or Ordovician phyllite. Crystal clusters and doubly terminated single crystals occur, ranging in length from $\frac{1}{16}$ to over an inch. Some crystals are free of chlorite at one end and are opaque with chlorite at the other. No phantoms were observed. Minerals associated with the crystals are small pyrite cubes, and rose-coloured calcite (with red fluorescence). R. S. M.

ROWLEY (ELMER B.). *Epidote and allanite at Schroon Lake, New York*. Rocks and Minerals, 1957, **32**, 451–461, 8 figs.

Epidote single crystals (up to $\frac{1}{4}$ inch by $1\frac{1}{2}$ inch) and fan-like aggregates occur as vein material in a coarse-grained diorite stock near Schroon Lake, Warren County, New York. Other minerals in the veins are actinolite, albite, apophyllite, arsenopyrite, asbestos, calcite, chabazite, chalcopyrite, chrysocolla, datolite, heulandite, hornblende, malachite, oligoclase (?), prehnite (sharp distinct individually terminated crystals), pyrite, quartz, serpentine, tourmaline. Each of these minerals is described in detail. Allanite occurs as black tabular crystals up to 3 ins. long in pegmatitic material in the vicinity of the epidote occurrence. The pegmatite is composed of pearl-gray feldspar, hornblende, and phlogopite. Around many of the allanite crystals radial fractures extend into the matrix rock. The allanite is very feebly radioactive. The paragenesis of the minerals and the geology of the region are reviewed.

R. S. M.

THOMAS (CHARLES A.). *New exposures of brucite and deweylite near West Chester, Penn.* Rocks and Minerals, 1959, **34**, 301–302.

Recent road work and excavations near West Chester, Pennsylvania, have brought to light brucite, deweylite, sepiolite, parasepiolite, magnesite, and serpentine. Descriptions of these minerals, especially their fluorescent properties, are given.

R. S. M.

PRATT (WILLARD). *New discovery of barite crystals in East Tennessee*. Rocks and Minerals, 1959, **34**, 502.

Baryte crystals occur associated with calcite crystals and aragonite in clay, near Church Hill, Hawkins County, Tennessee. The baryte is platy in habit. Crystals are from $\frac{3}{8}$ to 1 in. thick and weigh up to 3 lb. Bluish, greenish and pale lemon-yellow colours occur. R. S. M.

CUSICK (ALLISON). *Notes on the minerals of Amelia, Virginia*. Rocks and Minerals, 1959, **34**, 396–399.

Brief comments are made on nearly seventy-five mineral species which have been reported to occur in the old mica (pegmatite) mines of Amelia Court House, Virginia. Eighteen of these are indicated to be of common occurrence at the present time. References to original sources of information are not given.

R. S. M.

LASWELL (TROY J.). *Twinned calcite crystals from Lone Jack Quarry, Rockbridge County, Virginia*. Virginia Journ. Sci., 1957, **8**, 335.

Calcite scalenohedrons, up to 6 ins. long, are twinned with (0001) serving as the twinning plane. These crystals,

noted for their perfection, are found in cavities in the Lower Cambrian Shady (Tomstown) dolomite near Glasgow, Rockbridge County, Virginia. R. S. M.

GIANNINI (WILLIAM F.). *Large calcite crystals from Staunton, Virginia*. Virginia Journ. Sci., 1957, **8**, 332. [M.A. **14**-155]. R. S. M.

MITCHELL (RICHARD S.). *Jarosite from Natrona County, Wyoming*. Rocks and Minerals, 1959, **34**, 303.

Yellow, dull, pulverulent coatings of jarosite, less than 1 mm thick, occur in fractures in a dark-gray, massive, siliceous shale (probably Mowry formation, Upper Cretaceous) near Goose Egg, Natrona County, Wyoming. Limonite stains are intimately associated with the jarosite. Crusts of selenite also occur on the shale. Indexed X-ray powder data are given for the jarosite. Approximate hexagonal unit cell constants are a 7.3Å, c 17.2Å; $a:c$ 1:2.36. [M.A. **13**-369, **14**-72] L. G. B.

FRONDEL (CLIFFORD) & MARVIN (U. B.). *Cerianite, CeO₂ from Poços de Caldas, Brazil*. Amer. Min., 1959, **44**, 882-884.

Cerianite occurs as a friable buff-coloured powder on the southeastern slope of Morro do Ferro on the Pocos de Caldas plateau, Minas Gerais, Brazil. Its occurrence is indicative of surficial oxidizing conditions and it may have been derived from bastnäsite, thorogummite, and allanite. This cerianite was identified by its X-ray diffraction pattern and a was measured as 5.411 ± 0.004 Å. B. H. B.

ECKEL (EDWIN B.). *Geology and mineral resources of Paraguay, a reconnaissance*. Prof. Paper U.S. Geological Survey, 1959, **327**, 110 pp.

Large quantities of nonmetallic mineral resources, clay, limestone, building stone, sand, talc, and mineral pigments, are relatively unexploited. Iron ore occurs in many rich though small deposits. Manganese, copper, mica, and beryllium occur in small amounts. K. S.

VARIOUS TOPICS

[BELOV (N. V.)] Белов (Н. В.). Очерки по структурной минералогии [*Outlines of structural mineralogy*]. Минер. Сборник Львовского Геол. Общ. [Min. Mag. Lvov Geol. Soc.], 1958, **9** (12), 15-42, 17 figs.

Topics discussed: tabular forms and parting in corundum, intergrowths of garnet with mica and corundum, a metallic phase with a garnet structure, structural type of eulytine, cubic structures with non-intersecting threefold axes, structure of prehnite, glaciological structures, structure of smytheite, and others. [M.A. **14**-175] S. I. T.

[GINZBURG (A. I.)] Гинзбург (А. И.). Об изоморфных замещениях в литиевых слюдах [*On isomorphous replacements in lithium micas*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1957, **8**, 42-60, 3 figs.

A detailed crystal chemical study of lithium micas is given, various types of isomorphous replacement are discussed and a generalized formula for all lithium micas is suggested: $(K, Na, Rb, Cs) [Li_k(Mg, Fe, Mn)_n(Al, Fe^{3+})_m] [Si_pAl_{4-p}O_{10}](OH, F)_2$ with k 0 to 2, n 0 to 3, m 0 to 2, p 3 to 4. S. I. T.

[FRANK-KAMENETSKY (V. A.) & SOSEDKO (T. A.)] Франк-Каменецкий (В. А.) и Соседко (Т. А.). О характере изоморфизма в щелочных бериллах [*On the character of isomorphism in alkaline beryls*]. Доклады Акад. Наук СССР [C.R. Acad. Sci. U.S.S.R.], 1958, **118**, 815-817, 2 figs.

Three samples of beryl having alkali percentages respectively of 1.84, 3.39, and 7.23 when examined by X-ray methods showed constancy of the a -parameter but small increase of c -parameter with increasing alkali content. It is inferred that the changes in the lattice dimension are due to the replacement of the small ion of beryllium by larger ion of alkali metals. S. I. T.

[KORNILOV (N. A.)] Корнилов (Н. А.). Об аномальных оптических свойствах некоторых асбестовидных гидросиликатов [*On anomalous optical properties of some asbestos-like hydrosilicates*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (2), 115-125, 4 figs.

Chemical, optical, and X-ray study shows that in chrysotile-asbestos, actinolite, and asbestos-like chlorite optical characters anomalous as compared with those of the platy and scaly varieties of the same minerals can be observed. The anomalies are related to turning of the optical indicatrix about the axes of the fibres and approach of the $\alpha\beta$ section to a circle. The X-ray data suggest that the optical anomalies are due to the distortion of the lattice but more work is needed to establish the connection. S. I. T.

GILMAN (J. J.). *Etch pits and dislocations in zinc monocrystals*. Journ. of Metals, 1956, **8**, 998-1004, 16 figs.

A technique is described for producing etch pits at the sites of edge dislocations in zinc monocrystals. A survey was made of the etch pit patterns that appear in cases

crystals as well as crystals that were deformed in various ways, including basal glide, twinning, kinking, pyramidal glide, and bending. R. G. Wls.

NOVELL (L. C.). *Dislocation etch pits in apatite*. Acta Metallurgica, 1958, **6**, 775-778, 8 figs.

The author presents evidence to show the relationship between etch pits and dislocation sites in the mineral apatite. Optical microscope, electron microscope, and X-ray diffraction techniques were used. R. G. Wls.

LEH (A. S.) & VAN VLACK (L. H.). *Microstructures of iron-sulfur alloys*. Journ. of Metals, 1956, **8**, 950-958, 39 figs.

The distribution of sulfur in iron is discussed in terms of time, temperature, and the chemical composition of the sulfide. The effects of these variables upon the interfacial energies is discussed. R. G. Wls.

CHRIST (C. L.). *Garrelsita and datolite structure group*. Amer. Min., 1959, **44**, 176-177.

Because of the similarity of their X-ray diffraction patterns it is suggested that the formulas for datolite, bakerite, and garrelsita be written as: $\text{Ca}_4\text{B}_4(\text{SiO}_4)_4(\text{OH})_4$, $\text{Ca}_4\text{B}_4(\text{SiO}_4)_3(\text{BO}_3\text{OH})(\text{OH})_4$, and $\text{M}_4\text{B}_4(\text{SiO}_4)_2(\text{BO}_3\text{OH})_2(\text{OH})_4$ respectively, where $M = \text{Ba}, \text{Ca}, \text{Mg}$. A. C. H.

LÉVY (CLAUDE) & PROUVOST (JEAN). *Rapport entre la chalcoppyrite, la stannite et la renierite*. Bull. Soc. franç. Min. Crist., 1957, **80**, 59-66.

The X-ray powder patterns of renierite and germanite show great similarity and it is noted that they are very near to those of chalcoppyrite and stannite. It may be envisaged therefore that they have analogous structures in agreement with chemical analyses and under certain conditions which are discussed. That these minerals can be distinguished very exactly by their appearance is explained by study of their reflecting powders which are functions of the wavelength of the incident light. For each mineral the maximum reflecting power is found at a different part of the visible spectrum. E. J. & A. S.

HARTMAN (P.). *Sur la structure atomique de quelques faces de cristaux du type blende et wurtzite*. Bull. Soc. franç. Min. Crist., 1959, **82**, 158-163, 11 figs.

The electrostatic potential of crystal faces and its influence on their stability is discussed, with particular reference to diamond, halite, blende, and wurtzite. R. A. H.

BRICHARD (H.) & BRASSEUR (H.). *Sur les autunites naturelles et synthétiques*. Bull. Soc. franç. Min. Crist., 1958, **81**, 4-10 2 figs.

An X-ray study of natural autunite and of synthetic autunite [M.A. 4-307] has shown that they are both identifiable as the meta-autunite I of Donnay & Donnay. A dehydration study indicates that the meta-autunite I molecule has 6 molecules of water at ordinary temperature. When autunite is immersed in water it is converted to the type of autunite described by Bientema [Rec. Trav. Chim. Pays-Bas, 1938, **57**, 155]. Dehydration curves and X-ray powder data are given. R. A. H.

COPPENS (R.) & JURAIN (G.). *Répartition de la radioactivité dans un granite voisin d'un gisement uranifère (I)*. Bull. Soc. franç. Min. Crist., 1957, **80**, 95-96.

E. J. & A. S.

JEDWAB (J.). *Note préliminaire sur la distribution du tungstène dans un schiste noir de Nyamulilo (Ouganda)*. Bull. Soc. belge Géol., 1958, **67**, 141-146.

Macroscopic and microscopic descriptions are given of a black shale from Ruhizha, Nyamulilo region, Uganda, which contains about 200 p.p.m. of tungsten. Microchemical analysis shows that W is in part finely disseminated in the shale [Rec. Geol. Survey Uganda, 1954, p. 27]. F. Sch.

MOOKHERJEE (ASOKE). *Paragenesis of the manganese minerals associated with the gonditic rocks near Khapa, in Nagpur District (Bombay)*. Quart. Journ. Geol. Min. Met. Soc. India, 1958, **30**, 33-66, 3 figs.

Microscopical studies of manganese mineral assemblages in plain and reflected light are described. A. P. S.

ALI (S. Z.). *X-ray study of a magnetite ore*. Journ. Sci. Ind. Res. [India], 1957, **17B**, 241-247.

X-ray data on magnetite ore from Daltonganj Bihar carrying high content of Fe_2O_3 are discussed. The presence of maghemite is ruled out, and the excess of Fe_2O_3 attributed to presence of fine hematite particles. A. P. S.

ASENIO (I.) & SABATIER (G.). *Analyse thermique différentielle de quelques minéraux sulfurés et arsénies de fer, nickel et cobalt*. Bull. Soc. franç. Min. Crist., 1958, **81**, 12-15, 3 figs.

The d.t.a. curves for pyrrhotine, pyrite, arsenopyrite, löllingite, millerite, niccolite, gersdorffite, linnaeite, cobaltite, and skutterudite are illustrated. It is shown that the heats of oxidation of these minerals can be calculated approximately from their chemical composition. R. A. H.

LÉVY (C.). *Analyse thermique différentielle des minerais sulfurés*. Bull. Soc. franç. Min. Crist., 1958, **81**, 29-34, 4 figs.

D.t.a. curves are illustrated, and discussed briefly, for pyrite, blende, galena, marcasite, chalcopyrite, tennantite, tetrahedrite, bornite, covellite, chalcocite, native silver, argentite, proustite, pyrargyrite, and for various mixtures of sulphides. For all the minerals examined one or more endothermic peaks are characteristic of the metallic ion concerned, while the exothermic peaks are characteristic of the species.

R. A. H.

PABST (A.). *The pyrite-marcasite relation. A belated comment*. Amer. Min., 1959, **44**, 685-688, 1 fig.

From analytical data Buerger [M.A. 5-523] considered pyrite and marcasite chemically distinct compounds. Consideration of the analyses by statistical methods and including the results of Edwards and Baker [M.A. 11-554] suggests that the differences in the Fe:S ratio in pyrite and in marcasite arise from the accidents of sampling and analysis.

A. C. H.

ISIBASI (M.). *On iron sulphides in calcareous nodule*. Journ. Min. Soc. Japan, 1958, **3**, 597-602, 1 pl. (Japanese; English summary, *ibid.*, 798-799).

Calcareous nodules in muddy sediments of Miocene age near Sapporo, Japan, contain pyrite, marcasite, pyrrhotine, and calcite. It is considered that during diagenesis iron sulphides crystallized from melnikovitic substances precipitated in muddy sediments in a stagnant basin. The availability of sulphur as H_2S controls the proportion of pyrite, marcasite, or pyrrhotine.

R. A. H.

ANON. *A petrifying spring in Caldwell's Cave, West Virginia*. Rocks and Minerals, 1957, **32**, 30.

A quarter inch drusy layer of white calcite crystals was noted to have grown on a piece of stalactite which had lain in this spring for one year.

R. S. M.

SNEL (M. J.). *Étude des formations de travertins calcaires dans la province du Kivu*. Serv. géol. Congo Belge, 1956, Bull. **7**, fasc. 1, 32 pp., 3 figs.

The differences found in more than one hundred deposits of travertine can be related to their mode of formation. In many cases several cycles of solution of calcium bicarbonate and precipitation of calcium carbonate have occurred. The controlling factor in the formation of these travertines is the pH of the water; micro-organisms may be responsible for their colour or texture but are not able to arrest or initiate their precipitation. Several chemical analyses are tabulated.

R. A. H.

PÉRINET (G.). *Étude par diffraction des rayons X de la structure des ossements fossiles. I. Élaboration de méthodes d'études*. Bull. Soc. franç. Min. Crist., 1958, **82**, 31-43, 7 figs.

Following a discussion on the structure of fresh bone, the problems of the detection of $CaCO_3$ in the presence of tricalcium phosphate and of the determination of the parameters of apatite are considered in detail. [M.A. 11-194]

R. A. H.

IMREH (JOSEPH). *Cölestin-Kristalle in Eocän-Versteinerungen*. Neues Jahrb. Geol. u. Paläontol., Monatshefte, 1959, 513-517, 4 figs.

The occurrence of celestine crystals in several Eocene invertebrate fossils from the vicinity of Cluj, Rumania, is described. It is suggested that these have formed by the action of sulphate waters, arising from the oxidation of pyrite, on the $SrCO_3$ content of the aragonitic portions of the shells.

A. P.

GORDON (R. B.). *Colour centers in crystals*. Amer. Scientist, 1959, **47**, 361-375, 11 figs.

Colouration of crystals by radiation is briefly reviewed. The formation of Schottky defects, which increase the energy in a crystal, is described with the aid of an energy band scheme. Additive colouration of halite is produced by excess Na atoms and the relatively permanent F-centres are trapped electrons in negative ion vacancies. Crystals with many dislocations can be coloured by radiation most easily. Examples of colouration by natural radiation are cited for halite, quartz, and mica with pleochroic haloes.

B. H. B.

MATSUDA (S.). *On the rubidium and cesium in carnallite*. Journ. Min. Soc. Japan, 1958, **3**, 523-532, 3 figs. (Japanese; English summary, *ibid.*, 794).

The behaviour of trace amounts of Rb and Cs during the crystallization of halite, sylvine, bischofite, and carnallite was studied by isothermal evaporation of the saturated solutions using ^{137}Cs and ^{86}Rb as tracers. The logarithmic distribution coefficients of Rb (and Cs) were for halite 0.1 (0.02), sylvite 0.4 (0.03), bischofite 0.3 (0.3), and for carnallite 2.4 (1.3). Analysis of carnallite from the Stassfurt salt deposits gave K 14.28, Mg 8.72, Ca 0.08, Na 1.95, Cl 37.98, SO_4 0.48, Br 0.36, H_2O 36.24, = '99.99'; Rb 17 p.p.m., Cs 2 p.p.m. X-ray powder data are given for synthetic and natural carnallite.

R. A. H.

SHAW (T. I.) & COOPER (L. H. N.). *State of iodine in seawater*. Nature, 1957, **180**, 250.

Of the 40 μg /litre of iodine compounds in the upper oceanic layers, about half is iodide and half hypiodous

acid, which is formed instead of the thermodynamically stable iodate, because the rate of conversion of hypoiodous acid is slow at low concentrations, and because strongly reducing biological material will tend to prevent accumulation of iodate in sea water.

D. McK.

VELTNER (M.). *Derivatographic investigation of the anthracite of the Don*. Nature, 1959, **183**, 1254–1256, 1 fig.

Thermogravimetric and d.t.a. curves and also the rate of loss of weight have been determined using the derivatographic method [Zeits. anal. Chem., **160**–241]. C. H. K.

SHANDRA (D.). *Anisotropy of sclerotinites*. Nature, 1957, **180**, 297.

Anisotropy of reflectance is observed in sclerotinites from a variety of coals. The relation between maximum and minimum reflectance coincides with that for vitrinites at low values, but remains linear at high reflectance.

D. McK.

ROSSLING (B. F.). *Temperature variations due to the formation of a geosyncline*. Bull. Geol. Soc. America, 1959, **70**, 1253–1282, 17 figs.

The disturbance of thermal equilibrium produced by subsidence and sedimentation in the earth's outer layers is investigated by means of two models; in one, the heat reaching the surface is assumed to come from the deep interior, in the other, to be generated in the crust. The models consist of three horizontal layers, the top one representing the sedimentary layers, the middle one representing the crystalline part of the continental crust, and the lowest one representing the plastic substratum. Temperature variations are evaluated for instantaneous and finite subsidences of 6 and 13 km, assuming an initial sedimentary layer 2 km thick and a crystalline crust 30 km thick. It is shown that thermal adjustment requires millions of years, but the temperature increases much more rapidly during the first 20 million years or so. Both the stresses and the temperature of a certain portion of sediment increase with subsidence. At depths greater than a few hundred feet, the confining stress on the grain matrix corresponds, practically without any time lag, to the current depth of burial, but the time required for thermal adjustment is large enough to be significant in certain geological processes. Thus, lithification may be incomplete at certain depths because the temperature is still far below its final value.

A. L. A.

COVERING (J. F.). *The nature of the Mohorovicic discontinuity*. Trans. Amer. Geophys. Union, 1958, **39**, 947–955, 3 figs.

Chemical analyses of achondrites are cited in support of the theory that the upper mantle has essentially basaltic composition. On the hypothesis that the Mohorovičić discontinuity represents a phase transformation from basalt to eclogite, surface heat-flow measurements, and seismic evidence for the depth of the Mohorovičić discontinuity in continental and oceanic areas are used to derive an 'equilibrium line' for the basalt-eclogite transformation. The computed line closely approximates the experimental determination of the reaction albite + nepheline \rightleftharpoons jadeite made by Robertson, Birch, and MacDonald [M.A. **14**–38]. Geophysical implications of these theories are discussed.

F. R. B.

WILSON (J. T.). *Origin of the earth's crust*. Nature, 1957, **179**, 228–230.

C. H. K.

BASCOM (WILLARD) & LILL (GORDON). *A bore-hole to the earth's mantle: Amsoc's Mohole*. Nature, 1959, **184**, 140–144, 2 figs.

C. H. K.

RIDGE (M. J.). *Effect of temperature on the rate of setting of gypsum plaster*. Nature, 1959, **184**, 47–48, 3 figs.

C. H. K.

ERGUN (S.) & TIENSUU (V. H.). *Alicyclic structures in coals*. Nature, 1959, **183**, 1668–1670, 2 figs. [M.A. **13**–124]

C. H. K.

KRUMBIEGEL (GÜNTHER). *Die Kalkvorkommen in der alttertiären Braunkohle Mitteldeutschlands*. Neues Jahrb. Geol. Pal., Abhdl., 1959, **107**, 173–208, 6 figs., 4 pls.

Morphology, stratigraphy, and distribution of the calcites in the lignites of central Germany are described in detail. An attempt is made to explain the source of the CaCO_3 , the conditions of its deposition, and the origin of calcite sphaerites. There is a bibliography of 57 items.

A. P.

RUTTE (ERWIN). *Kalkkrusten in Spanien*. Neues Jahrb. Geol. Pal., Abhdl., 1958, **106**, 52–138, 34 figs., 2 pls.

The distribution, morphology, mode of formation, and ages of calcareous crusts in Spain are considered at some length.

A. P.

HALLA (F.) & VAN TASSEL (R.). *On the absence of complex ions in solutions of calcium and magnesium bicarbonates*. Journ. Phys. Chem., 1958, **62**, 1135–1136.

GREENWALD (I.). *Complexes of bicarbonate with magnesium and calcium*. Journ. Phys. Chem., 1959, **63**, 1328.

Conflicting evidence on the presence of ions of the type MeHCO_3^+ . W. T. H.

BENSON (R. E.) & CASTLE (J. E.). *Reactions of freshly formed surfaces of silica*. Journ. Phys. Chem., 1958, **62**, 840-843.

Grinding of fused silica ruptured Si-O bonds to produce active sites capable of reacting with various organic reagents. The sites could be preserved as long as 260 hours in an inert atmosphere. W. T. H.

BASSETT (G. A.). *The plasticity of alkali halide crystals*. Acta Metallurgica, 1959, **7**, 754-755, 1 fig.

Gold-decorated surfaces of strained alkali halide cleavage slices were observed in an electron microscope. Crystals examined immediately after straining showed closely and uniformly spaced slip steps. The mean spacing of the slip lines was remarkably uniform over the portion of the face available for observation. Crystals which were aged in air before straining showed the normal near-brittle behaviour, and no evidence of the surface steps. Alternative explanations for these behaviours are: that the surface sources play an important role in the deformation and are inhibited by penetration of atmospheric components; or, that internal sources lead to plastic deformation, but the dislocations are restricted by a brittle layer formed by exposure to the atmosphere. R. G. Wls.

BURKE (J.). *The growth of precipitates from solid solution*. Acta Metallurgica, 1959, **7**, 809-810.

A refinement is proposed for the method of Zener and Wert used in describing the growth of particles of a second phase from a homogeneous, supersaturated solid solution. The present method is based upon a model which is claimed to more closely represent real conditions. R. G. Wls.

COULOMB (P.). *Sur le blocage des dislocations par des cavités ou de petits précipités*. Acta Metallurgica, 1959, **7**, 556-559, 5 figs.

The author investigates the effects in a crystal in which dislocations are blocked by rings of spherical cavities or precipitates. Liberation of the blocked dislocations as the result of thermal agitation or mechanical stress is demonstrated. R. G. Wls.

BARTUŠKA (M.) & VEPŘEK (O.). *Dinas z vysocepyritického banskobelského křemence*. [Silica from the high-pyritic quartzite of Banská Belá.] Silikáty, 1958, **2**, 169-172, 16 microphot., 2 tables.

Fine-grained quartzite with a high content of finely and

uniformly disseminated pyrite from Sobov near Banská Belá, Slovakia, yields a good silica. The load test at temperatures up to 1695°C showed the mechanical stability of the material. The quartzite is macroscopically greyish green, massive; size of the quartz grains is between 2 and 15 μ . Chemical analysis: SiO_2 80.06, TiO_2 0.09, Al_2O_3 0.56, Fe_2O_3 12.52, MgO and CaO nil, Na_2O 0.05, K_2O 0.07, ign. loss 6.83. J. K.

BLAŽEK (A.) & CÍSAŘ (V.). *Tepelné chování uhličitany manganatého a jeho směsí s pyritem*. [Thermal behaviour of manganous carbonate and of its mixtures with pyrite.] Silikáty, 1959, **3**, 26-35.

The decomposition of MnCO_3 as well as the form of the d.t.a. curves is considerably affected by the atmospheric conditions in the furnace. D.t.a. and thermogravimetric analysis curves are given. J. K.

ŠAUMAN (ZD.). *Použití d.t.a. při studiu hydratace cementových slinů* [Application of d.t.a. in the study of cement clinker hydration.] Silikáty, 1959, **3**, 46-52, 11 figs., 1 table. J. K.

BABČAN (J.). *Príspevok k otázke produktov termického rozkladu minerálov s kaolinitovou štruktúrou*. [Contribution to the problem of products of thermal decomposition of minerals with kaolinite structure.] Silikáty, 1959, **3**, 20-25, 2 tables.

On ignition in a hydrogen atmosphere at 500°C elementary iron was liberated from septechlorites: chamosite of kaolinite type from Kaňk near Kutná Hora, and cronstedtite from Příbram, both in Bohemia, were used. Spinels $(\text{FeO}, \text{MgO})\text{Al}_2\text{O}_3$ and quartz were also formed. Elementary iron is not liberated from normal chlorites but is bound in $\text{MgO}(\text{Fe}_2\text{O}_3, \text{Al}_2\text{O}_3)$. It may be deduced that at the temperature given decomposition into amorphous oxides takes place, and not into a compound analogous to metakaolin. This result may have an important bearing on the problem of the character of the dehydration product of kaolinite. J. K.

SAYAR (M.). *Présentation et étude d'un quartz à cavités formes cristallographiques définies*. Bull. Soc. française Min. Crist., 1959, **82**, 231-233, 4 figs.

A crystal of quartz, the exact source of which is unknown but which is associated with dolomitic marbles in the west of the isle of Marmara, north-east of Erdek, Turkey, contains five relatively large negative crystals. Secondary inclusions are also present and it is suggested that communicating channels existed earlier between the large cavities, explaining the different amounts of liquid (probably water) contained by the latter. R. A. H.

ABBREVIATIONS AND SYMBOLS

used in the text of abstracts

M.M. .. Mineralogical Magazine : M.A. .. Mineralogical Abstracts : A.M. .. American Mineralogist

CHEMICAL & PHYSICAL-CHEMICAL

cation-exchange-capacity	c.e.c.
differential thermal analysis ..	d.t.a.
equivalent U_3O_8	eU_3O_8
ethylenediaminetetra-acetic acid ..	EDTA
heat of formation (absolute temperature subscript)	ΔH_f
ionic potential, e.g.	pH
insoluble residue	insol. res.
isotopes, e.g.	^{40}A , ^{40}K
loss on ignition	ign. loss
milliequivalent	me.
microgramme	μg
million-years	m.y.
not determined	n.d.
not found	nt. fd.
not present	nil
parts per million	p.p.m.
strength of solution, normal ..	N
— — — molar	M
substances in ionic state	
anions, e.g.	Cl^- , SO_4^{2-}
cations, e.g.	K^+ , Fe^{3+}
valency, e.g.	Cl^I , Fe^{II} , Fe^{III}

CRYSTALLOGRAPHIC & STRUCTURAL

Ångstrom unit (10^{-8} cm)	Å
crystal axes	a , b , c
— face indices	(hkl)
— form indices	{hkl}
— zone indices	[hkl]
indices of X-ray diffractions ..	hkl
intensity,	I
— relative	I/I_0
interplanar spacing	d
mica structural polymorphs ..	$1M_1$, $2M_1$
Siegbahn units	kX
space group. These words will be written in full	
unit cell, formula units	Z
— — repeat distances	a , b , c
— — reciprocal lattice lengths of edges	a^* , b^* , c^*
— — interaxial angles	
— — — direct lattice	α , β , γ
— — — reciprocal lattice ..	α^* , β^* , γ^*

OPTICAL

dispersion, e.g.	$r > v$
extinction angle, e.g.	$\gamma:c$
optic axial angle	$2V$
— — plane	O.A.P.
refractive index, in text	refr. ind.
— — of isotropic mineral ..	n
refractive indices	
of uniaxial mineral	ω , ϵ
of biaxial mineral	α , β , γ
sign of biaxiality	
negative	— or $2V_\omega$
positive	+ or $2V_\gamma$

PHYSICAL (other)

calorie	cal.
calorie, large	kcal.
cycles per second	c/s
degree centigrade	$^{\circ}C$
density	D (quote units)
— , relative, e.g.	D_4^{20}
gramme	g
hardness	H.
melting-point	m.p.
micron (10^{-4} cm)	μ
millimicron (10^{-7} cm)	m μ
pounds per square inch	lb/in 2
soluble	sol.
specific gravity, terms of reference not known	
known	sp. gr.
wavelength	λ

SYMBOLS

approximately equal to	\approx
equal to	$=$
equal to or greater than	\geq
equal to or less than	\leq
greater than	$>$
less than	$<$
not equal to	\neq
parallel to	\parallel
per cent.	%
per mille	‰
perpendicular to	\perp
proportional to	\propto

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